ODISHA GEOGRAPHY

OPSC

For General Studies/Optional

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Chapter - 1

PHYSIOGRAPHIC DIVISION

1

PHYSIOGRAPHIC DIVISION

GEOGRAPHY OF ODISHA

Odisha is a state in the Republic of India. It is situated in the eastern part of the country. Odisha is located between the parallels of 17 degree 49' N to 22 degree 34' N latitude and the meridians of 81 degree 27' E and 87 degree 29' E longitudes. It is surrounded by West Bengal to the north-east and in the east, Jharkhand to the north, Chhattisgarh to the west and north-west and Andhra Pradesh to the south.

The state has an area of 155,707 Sq Km, which accounts about 4.87% of total area of India and extends for 800 kilometres from north to south and 500 kilometres from east to west. Its coastline is 480 kilometres long. The state is divided into 30 districts which are further subdivided into 314 blocks.

Odisha's topography comprises fertile plains along the coast and forested highlands towards the interior. The Odia people are generally of Indo-Aryan stock.

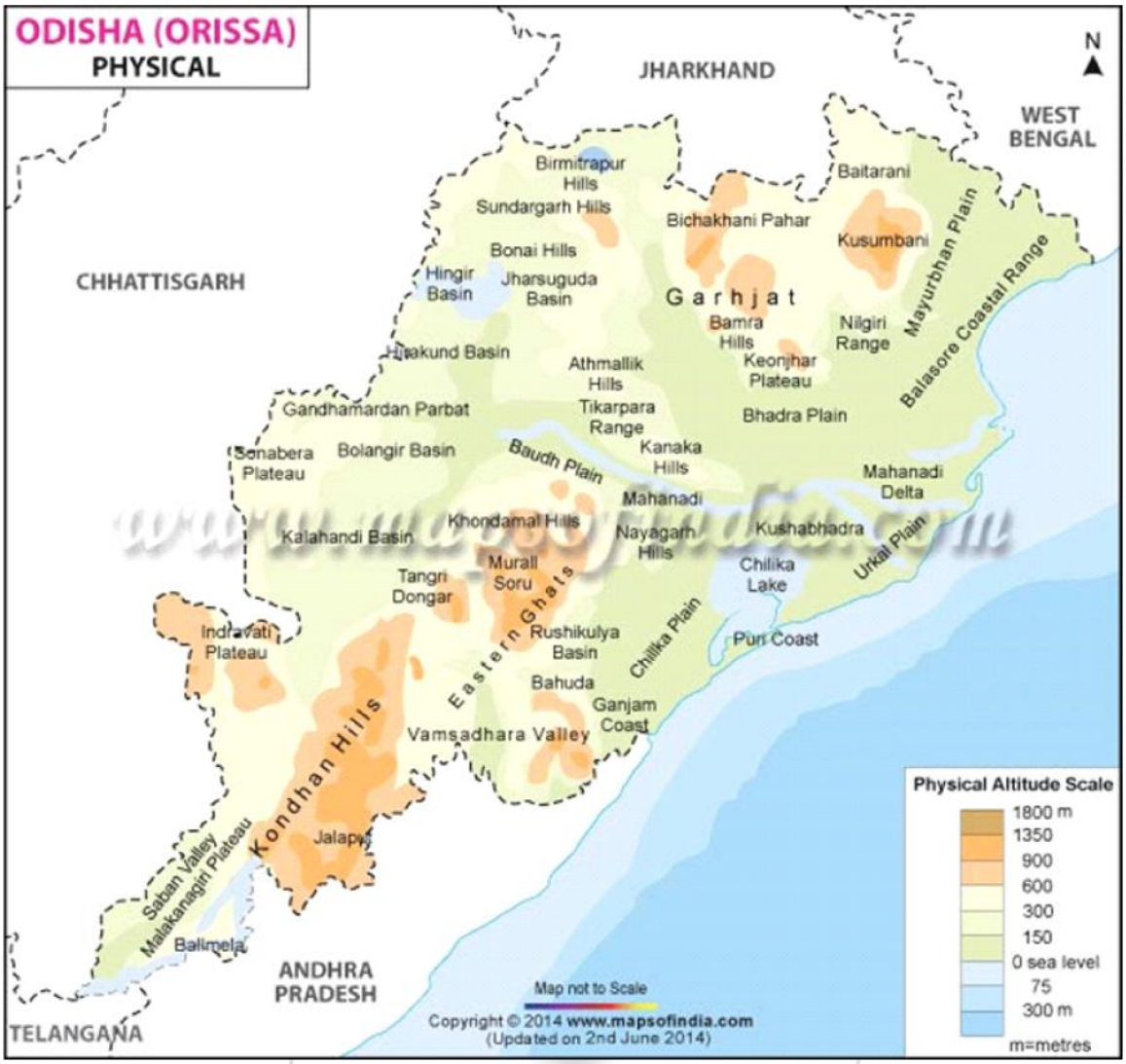
The Chota Nagpur plateau occupies the western and northern portions of the state, while along the coast are fertile alluvial plains and the valleys of the Mahanadi, Brahmani, and Baitarani rivers, which empty into the Bay of Bengal. These alluvial plains are home to intensive rice cultivation. A major nesting ground for the Olive Ridley sea turtles can be found in the beaches of Odisha; in Devi, Gahirmatha and Rushikulya are known nesting sites for the L. olivacea Indian Ocean population.

Although much of Odisha's forest cover has been denuded lately, one of the greatest attractions of Odisha is its still vast expanses of unspoiled natural landscape that offer a protected yet natural habitat to the state's incredible wildlife. There are many wildlife sanctuaries in Odisha. The Simlipal National Park Tiger Reserve is a huge expanse of lush green forest with waterfalls, inhabited by tigers, elephants, and other wildlife. The Bhitarkanika Wildlife Sanctuary has been protecting estuarine crocodiles since 1975.

Chilka Lake, a brackish water coastal lake on the Bay of Bengal, south of the mouth of the Mahanadi River, is the largest coastal lake in India. It is protected by the Chilka Nalabana Lake Bird Sanctuary, which harbours over 150 migratory and resident species of birds.

The highest mountain peak in the state is Deomali (1672 m), which is situated in Koraput district in southern Odisha. It is also one of the tallest peaks of the Eastern Ghats. Deomali is part of the Chandragiri-Pottangi mountain subsystem.

Physical Map of Odisha



PHYSIOGRAPHIC DIVISIONS OF ODISHA

Geographical location of Odisha comprises of many facets of Topology. There are the burning Chotnagpur plateaus on one hand while on the other lies the mystifying Bay of Bengal. The topography of the states reveals the exact location of Odisha on the axis of the earth and enlightens us about the unique physical features of the state.

Morphologically Odisha is divided into five parts-

a) The coastal plains,

b) The middle mountainous country,

c) The rolling upland,

d) The river valleys,

e) The subdued plateaus.

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The Coastal plains

The coastal plains of Odisha stretch from the Subarnarekha in the North to the Rushikulya in the South. They are narrow in the North, widest in the middle, narrowest in the lake Chilka coast and broad in the South.

The coastal plains are the gift of six major rivers. The rivers from North to South are the Subarnarekha, the Budha Balanga, the Baitarani, the Brahmani, the Mahanadi and the Rushikulya. The coastal plains can be termed as a land of 'six deltas' of the Subarnarekha and the Budha Balanga, the middle coastal plains the combined deltas of the Baitarani, the Brahmani and the Mahanadi and the South coastal plains (The Rushikulya plains).

The middle mountainous country

The mountainous region of Odisha covers about three-fourths of the area of the State. This region is a part of Indian peninsula. Here deep and broad valleys are cut by the Baitarani, the Brahmani, the Mahanadi, the Rushikulya, the Vansadhara and the Nagavali rivers. They are fertile, well-drained and thickly populated. Morphologically this region can be divided into the following units (a) the Simulia and the Meghasan mountains, (b) the Baitarani and the Brahmani interfluous, (c) the watershed between the Brahmani and the Mahanadi, (d) the watershed of the Rushikulya and the Vansadhara. The elevation ranges from 610 to 1,068 meters.

The rolling upland

The rolling uplands are lower in elevation than the plateaus. They vary from 153m. to 305m. They are the products of continued river action, are rich in soil nutrients, and are situated in the Koel Sankh basin of the upper Brahmani in the IB, the Suktel and the Tel of the middle Mahanadi and the Sabari basins. The rolling uplands may be grouped as follows: the Rajgangpur uplands, the Jharsuguda uplands, the Bargarh uplands, the Bolangir-Titilagarh-Patnagarh uplands, the Bhawanipatna uplands, the Malkangiri uplands and the Rairangpur uplands.

The river valleys

River valleys are net product of the action of rivers. They are fertile and at times present an undulating topography. The major river valleys of Odisha are associated with the Brahmani, the Mahanadi and the Vansadhara rivers.

The subdued plateaus

The subdued plateaus (305–610m.) reveal all the peculiarities of peninsular tablelands. They are almost flat and the monotony of orography is interrupted by the river valleys. These features are commonly met within the upper Baitarani and the Sabari basins of the Keonjhar and Koraput Districts, respectively. In these uplands sheet erosion is most common while gullying is confined to the river valleys. These plateaus can be divided into the Panposh-Keonjhar-Pallahara plateaus and the Nawrangpur- Jeypore plateaus.

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Chapter - 2

ODISHA AT A GLANCE

2

ODISHA AT A GLANCE

1. Total area (Sq. Kms.)	: 1,55,707
2. Total Population, 2011 census	: 4,19,74,218
(a) Total male	: 2,12,12,136
(b) Total female	: 2, 07, 62,082
3. Decadal growth rate, 2001-2011 (in percentage)	: 14.05%
4. Density of population per Sq. Km. (2011)	: 270
5. Sex ratio (Females per 1000 males), 2011	: 979
6. Total Urban Population, 2011	: 70,03,656
(a) Total Males	: 36,25,933
(b) Total Females	: 33,77,723
7. Total Rural Population, 2011	: 3,49,70,562
(a) Total Males	: 1,75,86,203
(b) Total Females	: 1,73,84,359
8. Total literates	: 2,67,42,595
(a) Total male literates	: 1,50,89,681
(b) Total female literates	: 1,16,52,914
9. Total Scheduled Castes Population (2011)	: 71,88,463
And percentage to total population	: 17.1 %
10. Total Scheduled Tribes Population (2011)	: 95,90,756
And percentage to total population	: 22.08 %
11. Number of Districts	: 30
12. Number of Sub-divisions	: 58
13. Number of Tehsils	: 317

14. Number of Grama Panchayats		: 6,227
15. Number of Blocks		: 314
16. Total Number of Villages, 2011		: 51,313
17. Number of Towns including Census Towns		: 223
18. Number of Municipal Corporations		: 05
19. Number of Municipalities		: 37
20. Number of Notified Area Councils		: 67
21. Number of Police-Stations		: 590
(General-534 + Women-6 + Energy-34 +Vigilance-7 + Cyber crime - 1 + CID -1+ Marine-5+ EOW-1 + STF-1)		
22. Number of Fire Stations	(i) Sanctioned	: 296
	(ii) Functioning	: 208
23. Number of Assembly Constituencies		: 147
24. Number of Lok Sabha Constituencies		: 21
25. Number of Rajya Sabha Seats		: 10
26. Coastline of Odisha		: 480 Kms

"Of all countries India is the best
And of all states, Odisha"
- Kapila Samhita

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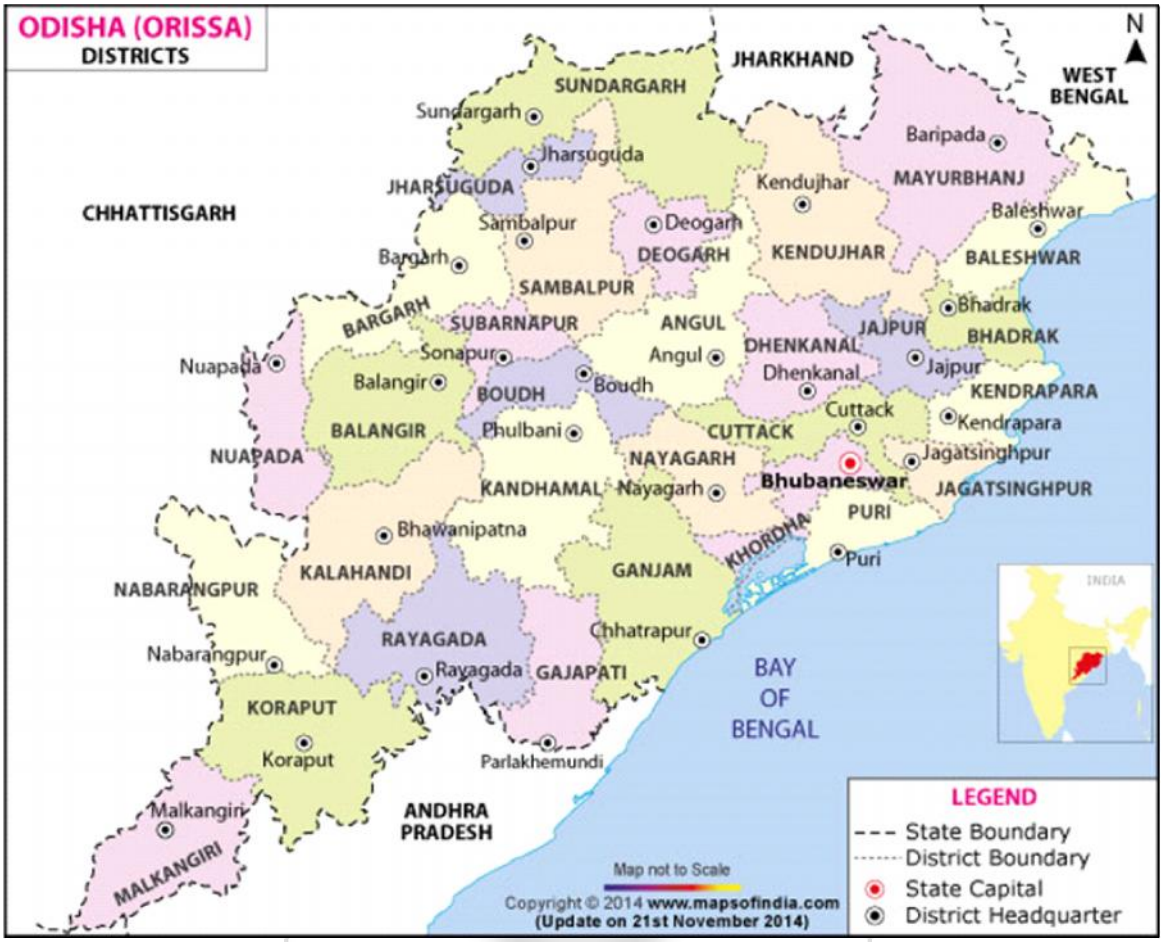
Political Map of Odisha



DEMOGRAPHIC PROFILE

ODISHA, the most captivating region of India, is often referred as an attractive treasure house of cultures and customs, religions and traditions, languages and literature, art and architecture, scenic beauties and wildlife. Exquisite temples and historic monuments, abundant greenery, virgin beaches, serpentine rivers, mighty waterfalls, forest-clad blue hills of the Eastern Ghats with rich wild life, makes Odisha an unforgettable destination of India. Visitors to the state feel the bounty and strive always toreturn for more. The land, while retaining its pristine glory in all its hues, offers the most modern amenities in tune with its great tradition of hospitality. A visual feast of colours, values and varieties, a cultural journey into one of the oldest civilizations in the world, Odisha promises wonderful experience.

PEOPLE OF ODISHA:

Odisha accounts for 3.47 per cent of the total population of country. The population density of the state is 269 as against the national average of 382 per sq.km. The sex ratio (Females per one thousand Males) of the state encouragingly stands at 979 against the national ratio of 943. However, urban sex ratio in Odisha remains lower at 934 as against the rural ratio of 988. The total

decadal growth as per 2011 census is 14.05 per cent while 2001 census reflected it at 16.25 per cent.

LITERACY:

Literacy in Odisha has increased from 63.1 percent in 2001 to 72.9 percent in 2011 census. The female literacy rate stands at 64.0 percent whereas the male literacy rate is 81.6 percent.

LANGUAGE:

Proven facts of 2500 years testify the glory and opulence of Odia language. It is one of the oldest languages in the country having Sanskritic origin and is spoken by about 84% of the people of the state and its outlying tracts. Odia became the first language from Indo-Aryan linguistic group, the sixth classical language of India. Although Odia is the official language of the State, English, Hindi, Urdu, Bengali and Telugu are widely understood and spoken as well. Odisha may be described as a polyglot state without any instance of linguistic intolerance.

FROM ORISSA TO ODISHA, ORIYA TO ODIA

According to the historians the name of Odisha has been derived from the word “Odra” or “Udra”. The then ‘Udradesh’ which was flourishing in every sphere, through the passing of time, it came under the colonial rule with its name changed to Odisha. Some illustrious sons of the soil tried to unite the dismembered tracts of the state and to form the State on the basis of language. With the consistent efforts and sacrifices of some towering personalities, at last, on 1st April of 1936, the dream of the people of the state became a reality and it was accorded the status of a State. It is the 1st State in the country to be formed on the basis of language. After a prolonged deliberation in the Odisha Legislative Assembly, a unanimous resolution to this effect was passed in the year 2008 which later received the nod of both the houses of the Parliament in 2010. On 24th March, 2011, Rajya Sabha passed the Bill to change the name of our State from Orissa to Odisha amending the Constitution to rename our language as Odia. On 1st of November, 2011, the Government of India came out with the Gazette Notification on the passing of the Odisha (Alteration of name) Bill, 2010 and the Constitution mentioned that the change of names came into effect from the 1st of November 2011.

1. SEX RATIO (No. Of Females per 1000 Males)

	2001 Census	2011 Census
Odisha	972	979
India	933	943

(a)Highest in Odisha

Sl No	District	Sex Ratio
1.	Rayagada	1051
2.	Gajapati	1043

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(b)Lowest in Odisha

Sl No	District	Sex Ratio
1.	Nayagarh	915
2.	Khordha	929

2. LITERACY RATE

	2001 Census	2011 Census
Odisha	63.1	72.9
India	64.83	72.98

(a)Highest in Odisha

Sl No	District	Sex Ratio
1.	Khordha	86.9
2.	Jagatsinghpur	86.6

(b)Lowest in Odisha

Sl No	District	Sex Ratio
1.	Nabarangapur	46.4
2.	Malkangiri	48.5

3. POPULATION & DECADAL GROWTH RATE

	2011 Census(2001-2011)
Odisha	14.05
India	17.72

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Chapter - 3

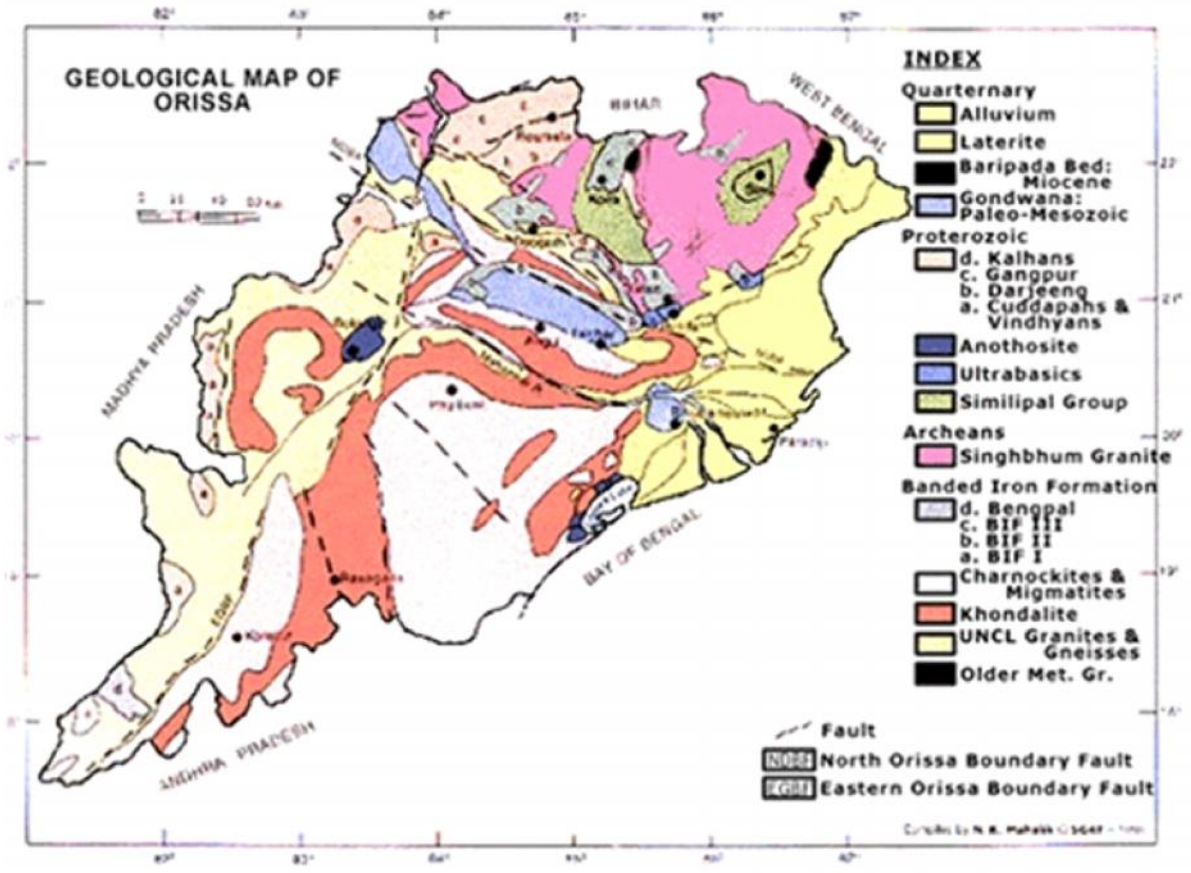
GEOLOGICAL EVOLUTION AND STRUCTURAL DIVISIONS

3

GEOLOGICAL EVOLUTION AND STRUCTURAL DIVISIONS

Geology deals with the origin, composition and history of the earth. The various stages of earth's history are classified by using terms for division of time and/or terms applying to strata accumulated during various periods. The 'time term' are era, epoch and stage. Their corresponding 'strata terms' are group, system, series, stages or formation. The Odisha State has a prominent Precambrian terrain and embraces a vast time span from about 4,000 million years to 600 million years. It occupies about 80% of the land surface of the state. The middle part of which shows a narrow tract of the Gondwana rocks that stretches almost east-west from Talcher to Hingir and is regarded as the Gondwana deposits of the Mahanadi Valley of Odisha.

Geological Map of Odisha



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The state comprises dominantly of Pre-cambrian rocks (73%) ranging in age from Mesoarchaean to Neoproterozoic. Phanerozoic rocks, represented by the GondwanaSupergroup (Late Palaeozoic – Middle/Late Mesozoic) and minor Tertiary patches, constituting about 8% of the state. The remaining 19% of the state is covered by Quaternary formations. The State of Odisha exposes rocks ranging in age from Meso archaean to Recent.

The only rocks of Tertiary cropping out namely the "Baripada beds" have very limited spread out, within a radius of 8 km. around Baripada in Mayurbhanj district. The geological history of all the eras of the earth has been recorded to some extent in Odisha. Forming a part of the north-eastern extension of the peninsular shield, Odisha is by and large underlain by Precambrian rocks. About 20 per cent of the total area of the state is constituted of the Phanerozoic rocks, Quaternary formation and Recent to sub-Recent alluvium. These latter are chiefly confined to the coastal tracts of the state.

The Precambrian rocks are mostly metasediments and occur as dissected patches separated by vast stretches of granites, ortho and para-gneisses, migmatites, charnockites, basic and ultrabasic intrusives and effusive mafic rocks.

The Phanerozoic rocks of Odisha are represented by the Gondwana Super-Group encompassing Upper Palaeozoic to Middle Mesozoic and the Baripada Beds of Lower Tertiary. The Gondwana of Odisha in a broad sense are of non-marine continental deposits and the Lower Tertiary rocks indicate a marine environment.

Sl No	Basin/Outlier	District	Geological Age
1.	Talcher Basin	Angul/Dhenkanal	Upper carboniferous Triassic (300-200 m.y)
2.	Ib-river basin	Sambalpur/Sundargarh Jharsuguda	Upper carboniferous Triassic (300-200 m.y)
3.	Katringia Outlier	Phulbani/Boudh	Upper carboniferous Permian (330-275 m.y)
4.	Salebhatta Outlier	Bolangir/Sambalpur	Upper carboniferous Permian (330-275 m.y)
5.	Athmallik Outlier	Angul/Phulbani/Baudh	Upper carboniferous Permian (330-275 m.y)
6.	Athgarh basin	Cuttack/Khurda	Lower cretaceous (140 m.y)
7.	Chhatrapur	Ganjam/Puri	Lower cretaceous (140 m.y)

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The stratigraphic set up of the Gondwana group of Odisha can be given as follows:

Age	Formation	Lithology	Area
Lower cretaceous (upper gondwana)	Athgarh	Conglomerate, Sandstone, Shale, Fireclay	Athagarh Basin Ganjam
Permo-triassic (Middle gondwana)	Kamthi	Conglomerate, shale, ferruginous, sandstone	Talcher and ib-river basin
Permo-carboniferous (lower gondwana)	Barakar	Sandstone, shale and coal,	Talcher,
	Karharbari	Sandstone, shale and coal	Phulbani
	Talcher	Boulder, bed, green shale, sandstone, Marl	Athmalik, Ib river Basin

1. Lithology:

The various Gondwana formations were deposited at different geological times under widely varying climatic and environmental conditions exhibiting striking dissimilarity in their lithology in various basins and outliers of this state. The gross lithology of the formations can be described as follows.

Talcher Formation:

In the type area of Talcher Basin, the basal Gondwana boulder bed and coarse sandstone inter-bedded with shale, siltstone and some stromatolitic limestone collectively measure 280 metres in thickness. The Ib-River succession is 130 metres thick, comprising fine and greenish, ripple-laminated sandstone. They occur as continuous strip at the fringes of both the basins. Occurrences of these rocks extending south easterly from Ib-River Basin to Talcher Basin have been recorded. Outliers exist at Phulbani, Athmallik and Bolangir also.

Karharbari Formation:

Attaining a thickness of 270 metres in Talcher and 90-125 metres in Ib-River sections, the Karharbaris conformably overlie the Talchers and are composed of fine grained micaceous sandstone; cross-bedded arkosic sandstone; coarse, pebbly, ferruginous feldspathic sandstone and lenses of conglomerate.

Athgarh Formation

Comprising dominantly of sandstones classified as quartz arenite, sublithic arenite, lithic arenite and lithic wackes characteristically lacking in feldspars in the classic components. These attain

thickness of upto 400 metres and include conglomerates, grits, carbonaceous shale, variegated shale and fireclay.

2. Structure:

The Gondwana sediments of Talcher and Ib-River Basins were deposited in the Satpura-Mahanadi Graben, defined by pronounced NW-SE trending lineaments on a Precambrian Platform, almost separating the Eastern Ghat Mobile Belt and North Odisha Craton. The northern and southern boundaries of the two basins are faulted and the sediments appear to have been preserved in the troughs.

On a regional scale, Talcher Basin takes the shape of a north westerly plunging syncline with closure in the east and the younger horizons outcropping progressively towards west. On the other hand, the beds dip northerly and number of coal seams increase in that direction, indicating a possible homoclinal structure.

Three sets of intra-basinal faults trending E-W, NE-SW and WNW-ESW have been recognised. The Ib-River Basin, which consists of three sub-basins, viz., Rampur, Hingir and Talbira, has been affected by two sets of intrabasinal faults trending NW-SE and E-W. The younger Athgarh Formation rests uncomfortably over Eastern Ghat granulites with a dip of 3°-10° to S and SE directions. The Gondwana sediments of Phulbani, Athmallik and Bolangir also rest unconformably over Precambrian basement.

3. Climate and Sedimentation:

The earliest period of glaciation as interpreted with the Talcher boulder bed switched over to warmer phase towards the end of the Talcher times as evidenced by stromatolitic limestone. Thus the Gondwana sedimentation was initiated in a post-glacial warm climatic condition. By the Kamthi period, ferruginous red beds indicated almost a sub arid climate and the sandstone thereafter might be interpreted as the indicators of a warm and humid time, facilitating diverse flora without extensive coal measures.

Sedimentation environment during the Talchers indicates lacustrine deposition in rift controlled lakes; adorned with a north to north-westerly palaeo-current pattern, indicating Eastern Ghat granulites as the immediate provenance.

The drought in the basins, enhanced through vertical oscillations, may have reversed the trend in Odisha sector of the Gondwanas, till the Lower Cretaceous. The vertical oscillations could have resulted in the yet another deepening of the basins with south-easterly palaeo-drainage this time.

The sedimentation tactonics of the outliers in Phulbani-Bolangir-Athmallik, however, have a different story to tell perhaps of isolated intermontane basins in Permo-Carboniferous having their own independent sedimentation history.

The state forms a part of the stable landmass of the Indian peninsula and is largely composed of some of the oldest rocks of the earth's crust. This stable landmass has not been folded since late pre-cambrian time. It resisted all later mountain-building forces by differential block movements of uplift and subsidence; moreover, it has been exposed to the continuous action of denuding agencies over very long periods of geological time.

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The topographic features of Odisha are thus a combined result of long continued erosion, peneplanation and uplifts. During and after uplifts, streams not only dissected and deepened their valleys on the plateau surface but also in the up-raised rim-like edges. Physiographically, Odisha is, therefore, a heterogenous land made up of

(1) a sea-board containing the deltaic alluvium of the Mahanadi, Brahmani and other rivers, also littoral deposits and parallel ridges of wind-blown sand;

(2) a hilly sub-montane region and

(3) a rugged hinterland, diversified by a succession of plateaux, uplands, hills and valleys.

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Chapter - 4

DRAINAGE OF ODISHA

4

DRAINAGE OF ODISHA

RIVERS OF ODISHA

There are four groups of rivers which flow through Odisha into the Bay of Bengal, They are:

(i) Rivers that have a source outside the State (the Subarnarekha, the Brahmani the IB and the Mahanadi).

(ii) Rivers having a source inside the State (the Budhabalanga, the Baitarani, the Salandi, and the Rushikulya).

(iii) Rivers having a source inside the Odisha, but flow through other states (the Bahuda, the Vamsadhara River, and the Nagavali River).

(iv) Rivers having a source inside Odisha, but tributary to rivers which flow through other states (the Machkund, the Sileru River, the Kolab, and the Indravati River).

1. River Mahanadi:

It is the major river of Odisha and the sixth largest river in India. It originates from the Sihawa hills of the Bastar Plateau in Raipur district of [Chhattishgarh]. It is about 858km long (494km in Odisha) and its catchment area spreads over 141,600km^2. (65,580km^2.) in Odisha. The river carries on an average about 92,600 million m of water.

2. The Brahmani:

It is the second largest river in Odisha. It originates as two major rivers like the Sankh and the Koel from the Chota Nagpur Plateau of Bihar and both join at Veda Vyasa near Rourkela of Sundargarh district of Odisha forming the major River Brahmani. It flows through the Eastern Ghats in Sundargarh, Deogarh, Kendujhar, Dhenkanal, Bhadrak and Jajpur districts into the Coastal Plains and enters into the Bay of Bengal along with a combined mouth with the Baitarani known as the Dhamara. The Brahmani is 799 km long (541 km In Odisha) and its catchment area spreads over 39,033 km^2 in Odisha).

3. The Baitarani:

It originates from the Gonasika hills of the Kendujhar district. It is 365 km long and its catchment area spread over 12,790 km^2. It entres into the Bay of Bengal after joining of the Brahmani at Dhamara mouth near Chandbali, Bhadrak.

4. The Subarnarekha:

It originates from the Chhotanagpur plateau of Bihar. It is 433 km (70 km in Odisha) and has a catchment area of 19,500 km^2 (3,200 km in Odisha) with a mean annual flow of 7,900 million.

Drainage of Odisha

5. The Budhabalanga:

It originates from the eastern slopes of the Similipal massif. It is about 175 km long having a total catchment area of 4840 km^2 with an annual flow of 2177 million. It is major tributaries are the Sone, the Gangadhar, the Catra etc.

6. The Rushikulya:

It originates from the Rushimala hills of the Eastern Ghats in Kandhamal district. It is 165 km long with 8900 km^2 of catchment areas. Its tributaries are the Baghua the Dhanei Badanadi etc. It has no delta at its mouth.

7. The Bahuda:

It originates from the Ramgiri hills of the Eastern Ghats in Gajapati district and joins the Bay of Bengal in Andhra Pradesh. Its length 73 km having a catchment area of 1250 km^2.

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8. The Vanshadhara:

It originates from the Flanks of the Durgakangar hills (Lingaraj hills) of the Eastern Ghats in Kalahandi district. It is 230 km long out of which only 150 km in Odisha. It entres into the Bay of Bengal at Kalingapatnam in Andhra Pradesh. It has a catchment area of 11500 km^2.

9. The Nagavali:

It originates from the Bijipur Hills of the Eastern Ghats near Lanji Garah. It is 210 km long out of which 100 km is in Odisha. It has a total catchment area of about 9410 km^2.

10. The Salandi:

It originates from the Meghasani Hills of the Similipal Massif in Keonjhar district. It is 144 km long with a catchment areas of 1793 km^2.

11. The Indravati:

It originates from the Eastern Ghats in Kalahandi districts. It is 530 km long with a catchment area of 41700 km^2 as a tributary it flows into the Godavari River.

12. The Kolab:

It originates from the Sinkaran hills of the Eastern Ghats in Koraput district. It has catchment areas of 20400 km^2.

13. Tel River:

It is one of the largest river of Odisha originating in Nabarangpur district and touching Chhattisgarh, Kalahandi, Balangir, Sonepur districts of Odisha and finally falling in Mahanadi.

WATERFALL

Odisha is a state with numerous rivers primarily fed by the monsoon rains. These rivers create gorges, river valleys, fertile basins and spectacular waterfalls as they cut through the state's undulating topography to join the Bay of Bengal.

There are countless waterfalls that dot the landscape of Odisha. Barenhipani, Joranda, Badaghagra, Sanaghagra and Khandadhar waterfalls are the prominent ones in Odisha. Duduma, Harishankar, Handibhanga, Hatipathar, Khanduala, Miriglotah, Mruga Mahadev, Nrusimhanath, Phurli Jharan, Pradhanpat and Putudi are other minor waterfalls in the state of Odisha.

1) Barehipani

This picturesque fall (Barehipani - 399 metres and Joranda - 150 metres) situated in the core area of Simlipal National Park. The Barehipani Falls is located in the Mayurbhanj district in the Indian state of Odisha. It is amongst the highest waterfalls in India. The waterfall is situated on the Budhabalanga River flowing over the Meghasani mountain. It is tiered waterfall with two drops. The tallest single drop is 259 metres (850 ft).

Barehipani is India's 2nd highest and Odisha's highest waterfall. The height of the waterfall is 1309 ft just 55 mt less than Kunchikal Falls which is the highest waterfall of India. The source of the waterfall is Budhabalanga River that flows over the mountain. It is a 2 tier water fall, which means the water falls in two drops. The river Budhabalanga falls from the stiff heights of the Simlipal ranges to create these majestic falls 1200 foot (399 meters) high.

2) Joranda

Similipal is also home to Joranda waterfall (150 metres) amidst the rich Sal vegetation. The tall trees around the fall create a wonderful ambience.

The Joranda Falls is located in the core area of Simlipal National Park in the Indian state of Odisha. The Barehipani Falls is located close to the Joranda Falls. It is the 19th highest waterfall in India. The water plunges over a lofty cliff in a single drop, spreading out slightly as it falls. It is a straight and single drop waterfall.

3) Devkund

Devkund Waterfall, in periphery of Similipal Tiger Reserve, has a series of beautiful waterfalls and the holy shrine of Goddess Ambika. On the outer periphery of the Sal forest, the perennial waterfall is situated under the Udala block. The water falls from the hilltop in five stages by creating five kundas or reservoirs named Amrita Kunda, Ghrita Kunda, Haladi Kunda, Devi Kunda & Deva Kunda. On the banks of the river Deva, festivals like Raja and Makar Sankranti are celebrated every year.

4) Khandadhar

This beautiful Khandadhar waterfall in the mineral-rich forests of Sundargarh district and is the second highest waterfall in the state. The magnificent view of the cascading waters also make for a good picnic spot and the entire area is a treasure trove of rare medicinal plants.

Located amidst its lush forests is Odisha's most famous waterfall, the Khandadhar fall (about 244 metres). The beauty of this place makes it a site not to be missed. The Khandadhar Falls is located at Nandapani in Sundergarh district in the Indian state of Odisha. It is the 12th highest waterfall in India. It is a perennial horse tail type waterfall. The Korapani Nala, a small stream, plunges from a height of 244 metres (801 ft) in a single drop.

5) Badaghagra/ Sanghagra

Situauted in Keonjhar district. Part of the Ghagra river, a tributary of Baitarani. The 60 metres fall is also near the Sanghagra falls (30 metres). However, another picturesque spot is Gonasika (45 kms from Keonjhar) where the river Baitarani goes underground briefly and emerges further down over a stone projection shaped like the nose of a cow. The twin destinations provide unmatched fun to nature lovers and trekkers alike.

6) Nrusimhanath

The sacred hills of Gandhamardan in Bargarh district enshrines the temple of Nrusimhanath. Waterfalls like Bhimadhar, Gadadhar, Guptadhar & Chaladhar are some beautiful locations. Besides the falls, tourists also love to see ancient archaeological remains present in the area.

7) Harishankar

On the southern side of Gandhamardan hills, Harishankar shines with a series of beautiful waterfalls cascading on the hill slopes. An added advantage to the place is Nrusimhanath.

Harishankar, a place of pilgrimage, famous for its uncommon scenic charms and the presence of Hari and Shankar, the dual deities of the Vaishnav and Shaivite sects of Hinduism. A perennial

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stream gushes forth onto its granite bed to form cascades at different stages, the last fall providing a natural water slide to bathers. As a cool resort in the lap of nature, Harishankar is a panacea for the heat in the summer. A very holy place for both the Vaishnavs and the Shaivites, Harishankar is the popular pilgrimage spot.

8) Phulrijharan

The 16 metres high waterfall is in Kalahandi district. The rainbow created by sun rays playing with the water spray, creates a special charm.

9) Pradhanpat

Situated in the Koraput District. This beautiful fall is part of Pradhanpat hill, which offers a scenic view and the water comes with many steps from the top creating several natural swimming pools on the hill itself. This waterfall had the first hydro-electric power unit in the state.

The Pradhanpat hill, with its picturesque waterfall, offers a rare scenic beauty. These falls are close to Deogarh. The Pradhanpat hill, with its picturesque waterfall, offers a rare charming beauty. These falls are close to Deogarh, the district headquarters town, which is pleasantly located with the background of wooded hills.

10) Duduma

The southern-most district of the state, Malkangiri, has got this beautiful waterfall besides several marvellous lakes spread across the region.

The Duduma Waterfall, 157 metres (515 ft) high, is formed by the Machkund river in Odisha, India. It forms a part of the boundary between Andhra Pradesh and Odisha. Duduma Waterfalls is one of the highest waterfalls in Southern India. Machhakund is an important place for pilgrimage, called Matsya Tirtha. Its water of this fall is used in the production of electricity by waterpower. Developed as a hydro-electric project with a beautiful township amidst deep greenery of nature, Machhakund forms a precipitous waterfall. It is also famous for the Machhakund Hydro-Electric Project.

Apart from the waterfalls Gandahati in Gajapati district and Khandadhar, Gundichaghai and Handibhanga in Keonjhar district also draws large crowd.

Spring

There are a number of Mountain springs and hotspring in Odisha. The Badaghagara and Sanaghagara in Keonjhar district, Saptasajya in Denkanal district, Chandikhole in Jajpur district, Atri and Barunei in Khorda district, Taptapani, Narayani and Nirmalajhar in Ganjam district, the Patalaganga in Kalahandi district, Nursinghanath in Bargarh district and Harisankar of Balangir district of Odisha.

LAKES

A lake is an area of variable size filled with water, localized in a basin, that is surrounded by land, apart from any river or other outlet that serves to feed or drain the lake. Lakes lie on land and are not part of the ocean, and therefore are distinct from lagoons, and are also larger and deeper than

ponds, though there are no official or scientific definitions. Lakes can be contrasted with rivers or streams, which are usually flowing. Most lakes are fed and drained by rivers and streams.

Natural lakes are generally found in mountainous areas, rift zones, and areas with ongoing glaciation. Other lakes are found in basins or along the courses of mature rivers. In some parts of the world there are many lakes because of chaotic drainage patterns left over from the last Ice Age. All lakes are temporary over geologic time scales, as they will slowly fill in with sediments or spill out of the basin containing them.

Many lakes are artificial and are constructed for industrial or agricultural use, for hydro-electric power generation or domestic water supply, or for aesthetic or recreational purposes or even for other activities.

According to the origin lakes may be of different types such as-Tectonic lake, Periglacial lake, Subglacial lake, Glacial lake, Oxbow lake, Crater lake, Lava lake, Ephemeral lake, intermittent lake, or seasonal lake.

Major lakes of Odisha are The Chilika Lake,The Kanjia Lake, The Anshupa Lake & The Tampara Lake.

1. Chilika Lake

Chilika lake is a brackish water lagoon, spread over the Puri, Khurda and Ganjam districts of Odisha state on the east coast of India, at the mouth of the Daya River, flowing into the Bay of Bengal, covering an area of over 1,100 km^2. It is the largest coastal lagoon in India and the second largest lagoon in the world after The New Caledonian barrier reef in New Caledonia.

It is the largest wintering ground for migratory birds on the Indian sub-continent. The lake is home to a number of threatened species of plants and animals.

The lake is an ecosystem with large fishery resources.

The lagoon hosts over 160 species of birds in the peak migratory season. Birds from as far as the Caspian Sea, Lake Baikal, Aral Sea and other remote parts of Russia, Kirghiz steppes of Mongolia, Central and southeast Asia, Ladakh and Himalayas come here.

In 1981, Chilika Lake was designated the first Indian wetland of international importance under the Ramsar Convention.

The highly productive chilika lagoon eco-system with its rich fishery resources sustains the livelihood for many fisher men who live in and near the Lagoon. The water spread area of the Lagoon ranges between 1165 and 906 km^2 during the monsoon and summer respectively. A 32 km long, narrow, outer channel connects the lagoon to the Bay of Bengal, near the village Motto.

Microalgae, marine seaweeds, sea grasses, fishes and crabs also flourish in the brackish water of the Chilika Lagoon.

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Chilika lake

2. Anshupa Lake

The 141-hectare Ansupa Lake is a horseshoe shaped fresh water lake on the left bank of the Mahanadi river, opposite to Banki in Cuttack district, Odisha. Ansupa Lake also acts as a shelter for the migratory birds in the wintry weather season. It is a fresh water lake situated amidst the Saranda Hills and enclosed by bamboo tree greenery and mango trees. To visitor's delight, there is boating and fishing facilities in the Ansupa Lake.

This small but extremely picturesque Ansupa lake holds a prominent position in the tourist map of Odisha for its beauty. It is one of the major fresh-water lakes of India.

3. Kanjia Lake

Kanjia Lake is a natural lake on the northern outskirts of Bhubaneswar, Odisha, India. While the main lake covers 75 hectares (190 acres), the total wetland covers an area of 105 hectares (260 acres) with the scuba diving facility. It has a rich biodiversity and is a wetland of national importance which is helpful for maintaining the city's ecology.

The lake's ecosystem consists of 37 species of birds, 20 species of reptiles, 10 species of amphibians, 46 species of fish and three species of prawns, 10 species of sub-merged macrophytes, 14 species of floating macrophytes and 24 species of emergent macrophytes.

The lake is facing threat from uncontrolled quarrying, the dumping of solid waste and haphazard real estate construction on its fringe areas.

The lake is a part of the Nandankanan Zoological Park and is used for recreational boating by visitors.

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Chapter - 5

CLIMATE OF ODISHA

5

CLIMATE OF ODISHA

The weather in Odisha is greatly influenced by the sea, because of its proximity to the sea. Odisha enjoys a tropical monsoon type of climate. Here, summers are very hot and monsoons are very obliging. The climate of the region is tropical resulting in very high temperature in the months of April and May. The average annual rainfall in the state is about 200 cm.

Odisha experiences three main seasons, namely summer season, rainy season and winter season. Though the weather in the state remains pleasant throughout the year, the best time to explore its beauty is the winter season, which lasts from October to March. Given below is more information on the weather of Odisha.

Three seasons are mainly experienced in Odisha:

a) Summer Season (March-June)

The summer season in Odisha commences in March and stretches till June. The temperatures are quite high during this time and the sun very harsh. The maximum temperature of Odisha, in the summer season goes well above 40° C. It is warm almost throughout the year in the Western districts of Sundergarh, Sambalpur, Baragarh, Bolangir, Kalahandi and Mayurbhanj with maximum temperature hovering between 40-46° C.

b) Rainy (Monsoons) Season (July-September)

The rainy season of Odisha starts in July and lasts till October. Southwest monsoons head its way in the beginning of June and by July, the whole of the state is under its influence. By the mid October, southwest monsoons withdraw from this region completely. The coastal areas of the state usually experience cyclone and tornado during this season. The average rainfall is 150 cm, experienced as the result of south west monsoon during July-September. The month of July is the wettest and the major rivers may get flooded. Some coastal parts of the state also experience cyclone and tornado during this time. The state also experiences small rainfall from the retreating monsoon in the months of October-November. January and February are dry.

c) Winter Season (October-February)

The winter season in Odisha lasts for approximately five months, from October to February. The weather in this season is quite chilly and the minimum temperature dips to as low as 7 deg C. Winter is not very severe except in some areas in Koraput and Kandhamal where minimum temperature may drop to 3-4° C.

However locally there are six seasons:

1. Grishma (Summer), Baisakha and Jyestha (mid-April to mid-June)
2. Barsa (Rainy season), Ashadha and Sravana (mid-June to mid-August)
3. Sharat (Autumn), Bhadraba and Aswina (mid- August to mid-October)

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4. Hemanta (Winter), Kartika and Margasira (mid-October to mid-December)
5. Sisira (Winter), Pausa and Magha (mid-December to mid-February)
6. Basanta (Spring), Falguna and Chaitra (mid-Feb to mid-April)

FACTORS INFLUENCING THE CLIMATE

Climate indicates a generalised and composite picture of the average weather conditions spread over a long period, for a given large area. Due to the combined effects of the variations of the major climatic elements in different parts of the world and also the varied nature of the earth's surface, every location has a distinctive climate.

"The factors which influence the climate of a place are as follows:

(a) Latitude:

Temperature, in general, decreases from the tropical to polar latitudes. Thus Peninsular India, which lies mostly in tropical latitudes, experiences no winter season. On the other hand, the Northern Plain of India lying north of the Tropic of Cancer has a distinct winter season. Odisha lies within Tropic of Cancer.

(b) Proximity to the Sea:

Places near the sea have more equable climate than those in the interior of the land. For this reason, the diurnal and annual variation of temperatures are greater in the north-western part of India than in the coastal plains.

(c) Altitude:

Temperature normally decreases with increasing height. Thus, the mean temperature of a place with lower elevation is high & vice versa.

(d) Direction of Prevailing Winds:

In Peninsular India, the direction of prevailing summer monsoonal winds is from the west. Thus, places on the western margin of Peninsular India experience more rainfall than those on the eastern margin. Likewise, the direction of south-west monsoon in the Ganga Plain is from the east. Thus, the rainfall decreases from the east to the west in this region.

(e) Direction of Mountain Ranges:

When the moisture-laden winds are confronted with the mountain ranges, they are forced to rise up and cause heavy rain in windward side while the rain is less in leeward side.

(f) Character of Soil:

Different kinds of rocks or soils absorb heat at different rates. For this reason, sandy desert of Rajasthan has great daily and annual ranges of temperature, while the range of temperature is less in the deep alluvial soil of the lower Ganga basin.

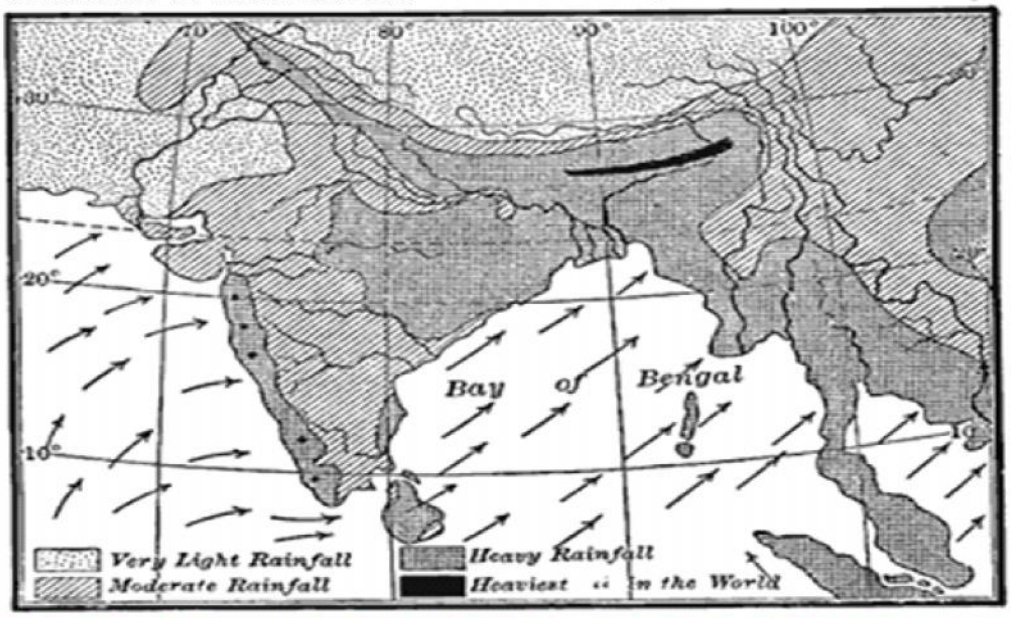
MONSOONS

The monsoon season of Odisha starts in July and lasts till October. Southwest monsoons head its way in the beginning of June and by July, the whole of the state is under its influence. By the mid October, southwest monsoons withdraw from this region completely. The coastal areas of the state usually experience cyclone and tornado during this season.

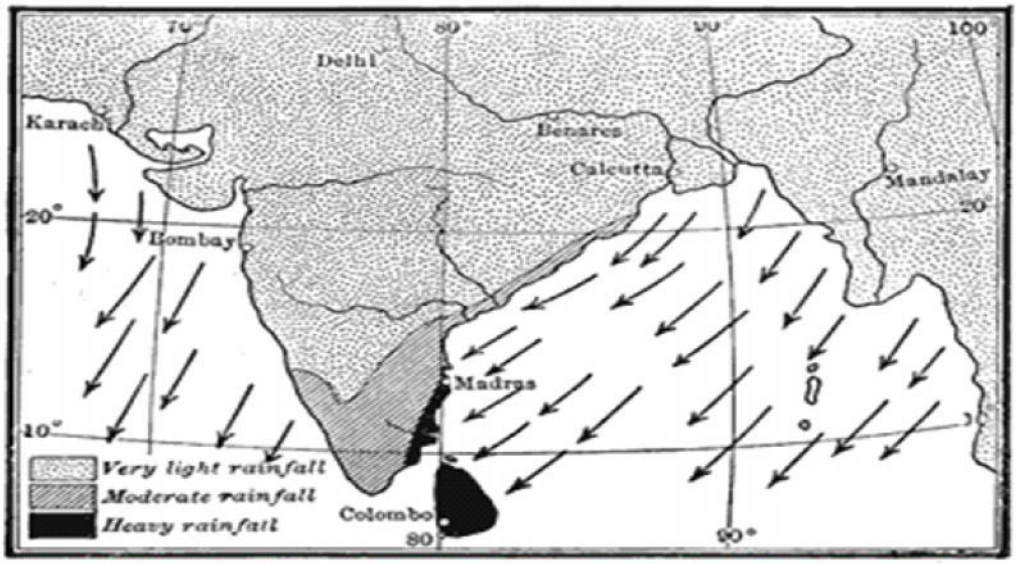
The climate of Odisha falls under the category of tropical monsoon type of climate and in this, Odisha is not different from the rest of the country. Odisha receives a decent annual average rainfall of about 200 cm. June ushers in the south-west monsoon and it's in mid-October that the rains bid adieu to the state.

THE MECHANISM OF MONSOONS AND THEIR ORIGIN

Monsoon are large scale seasonal wind systems blowing over vast areas of the globe, persistently in the same direction, only to be reversed with change of season. They affect the largest land masses. Asia is the only continent which experiences regular visit of monsoons of completely reversing and persistent wind regimes. Australia and Africa are also affected by monsoons though not to the same extent as south East Asia.



SUMMER MONSOON WINDS



WINTER MONSOON WINDS

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In northern hemisphere during winter due to extreme cold, a semi-permanent intense high pressure develops over Siberia. From the periphery of the Siberian high, northerly to north-easterly winds blow across eastern Asia. This wind system extends into Bay of Bengal where it is reinforced by a similar stream from India. However, strong winds, often attaining gale force are quite common over the West Pacific and South China Sea. In summer, the reverse occurs. The pressure over the interior is lower and huge mass of air including that from southern hemisphere is drawn into circulation. The south east trades of the south equatorial Indian Ocean after crossing the equator, due to the action of Coriolis force, become south-westerly and invade the whole of South Asia. This constitutes the summer monsoon or SOUTH-WEST MONSOON over India. The winter monsoon is also known as the NORTHEAST MONSOON. For similar reasons, northern portion of Australia and West Africa experience monsoons though their development is not as intense as that of Asiatic Summer monsoon.

CHARACTERISTICS OF THE MONSOON

The summer monsoon is a major perturbation in the general circulation of the atmosphere. It serves as a large scale mechanism of redistribution of excess of heat, received in the equatorial areas to higher latitudes.

We shall be satisfied in understanding some of the important synoptic features of the Indian summer monsoon and see how various features of the monsoon can be predicted. Monsoons as reversing seasonal surface wind system over the north Indian Ocean were discovered about six centuries ago by the early navigators of the sailing vessels.

The word 'Monsoon' has its origin in the Arabic root 'Mausim' which means season. In the surface layers the Intratropical convergence zone (ITCZ), from its mean winter position close to the equator rapidly shifts about 20^0 N to 25^0 N to establish itself as the monsoon through over the Indo-Gangetic Plains. Further, complete reversal in wind circulation at all the levels of troposphere takes place. This mean upper winds over India at 200mb during April and July, April winds represent the conditions before the onset of the monsoon and that of July denote the full monsoon circulation.

The westerly subtropical JET STREAM located to the north of about 20° N, with the onset phase of the monsoon, suddenly shifts to the north of Tibetan Plateau. The sudden shift may be considered as the forerunner of the advent of the monsoon over Sri Lanka and extreme Southern part of India. Simultaneously, the TROPICAL EASTERLY JET STREAM, characteristic of the southwest monsoon appears over the peninsular India. It, however, appears at a greater height than the westerly JET. The JET STREAMS occur in the vicinity of the tropopause which is the highest in the tropics and lowest in the Polar Regions. The subtropical JET occurring at lower altitudes is related to the atmosphere of the middle latitudes whereas the easterly JET entirely belongs to the tropical atmosphere. The northward shift of the westerly JET implies that the mid latitude systems are separated out and do not have direct bearing on the synoptic patterns of the active and strong monsoon. The presence or the influence of the midlatitude systems during the monsoon period over these areas only results in WEAK MONSOON conditions. Upper air temperature distribution also reversed with the onset of monsoon.

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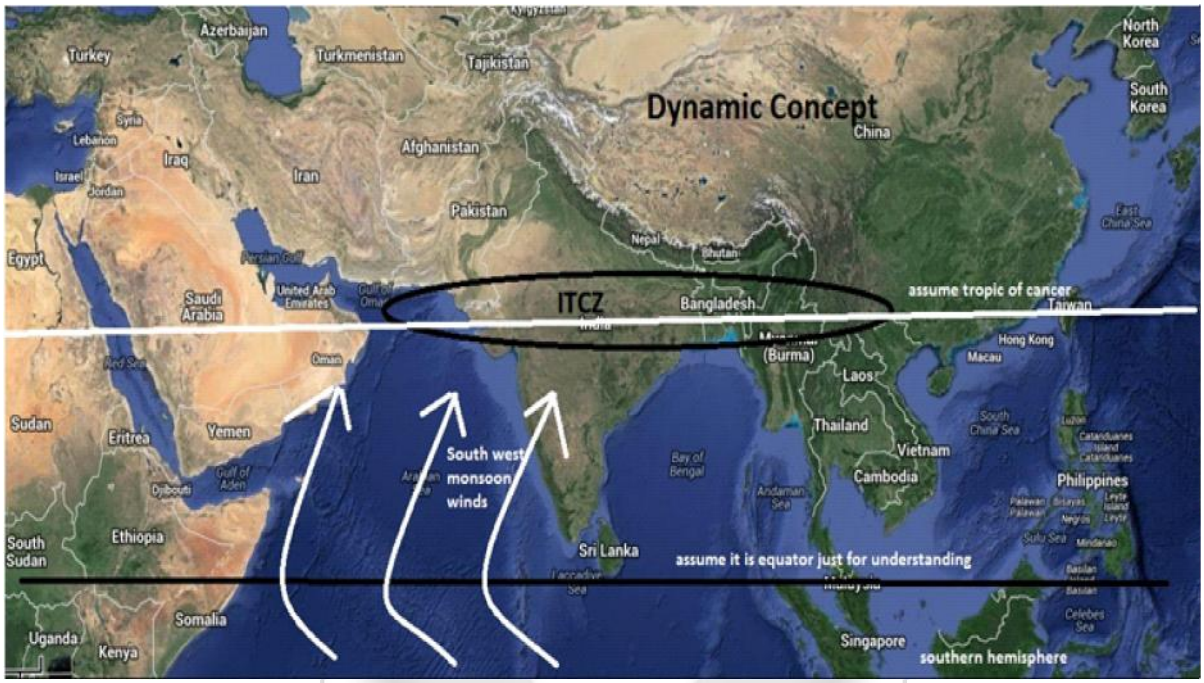
Mechanism of Monsoon



ONSET AND PROGRESS OF MONSOON

Since the onset is from the south and the withdrawal of monsoon is from the north the duration of the North India is shorter than that over the peninsular India. Over the extreme peninsular India, the withdrawal of the southwest monsoon often coincides with the establishment of the northeast monsoon.

The progress of monsoon also shows considerable variation. The southeast trades on crossing the equator get deflected and become south-westerlies. They divide into two branches by the time the flow reaches Sri Lanka and progress further northwards as the Arabian Sea branch and the Bay of Bengal branch.

Often it becomes difficult to distinguish initial monsoon rains from the then prevailing pre-monsoon thundershowers. This difficulty is more pronounced in Kerala and over northeast India. Incidentally, these are the areas where the Arabian Sea branch and the Bay of Bengal branch respectively strike the country first. The Bay of Bengal branch which arrives earlier over the Andaman Sea that the appearance of the Arabian Sea branch over the coast of Sri Lanka and India, gradually progresses northwards. The northward extension of the monsoon is arrested by the Himalayas. But it effectively penetrates as continuous south westerly flow across Myanmar, Thailand, etc.

Odisha enjoys tropical climate. Monsoon rainfall is of highest importance because it directly controls the agriculture of the state. About 80% of the total annual precipitation is received during the monsoon seasons. Hence, the variation of rainfall affect the agriculture of Odisha. Its distribution is not uniform. There are several spells of heavy rains. Odisha experiences four main seasons as per the Meteorological Department of the Government of India. They are as follows:

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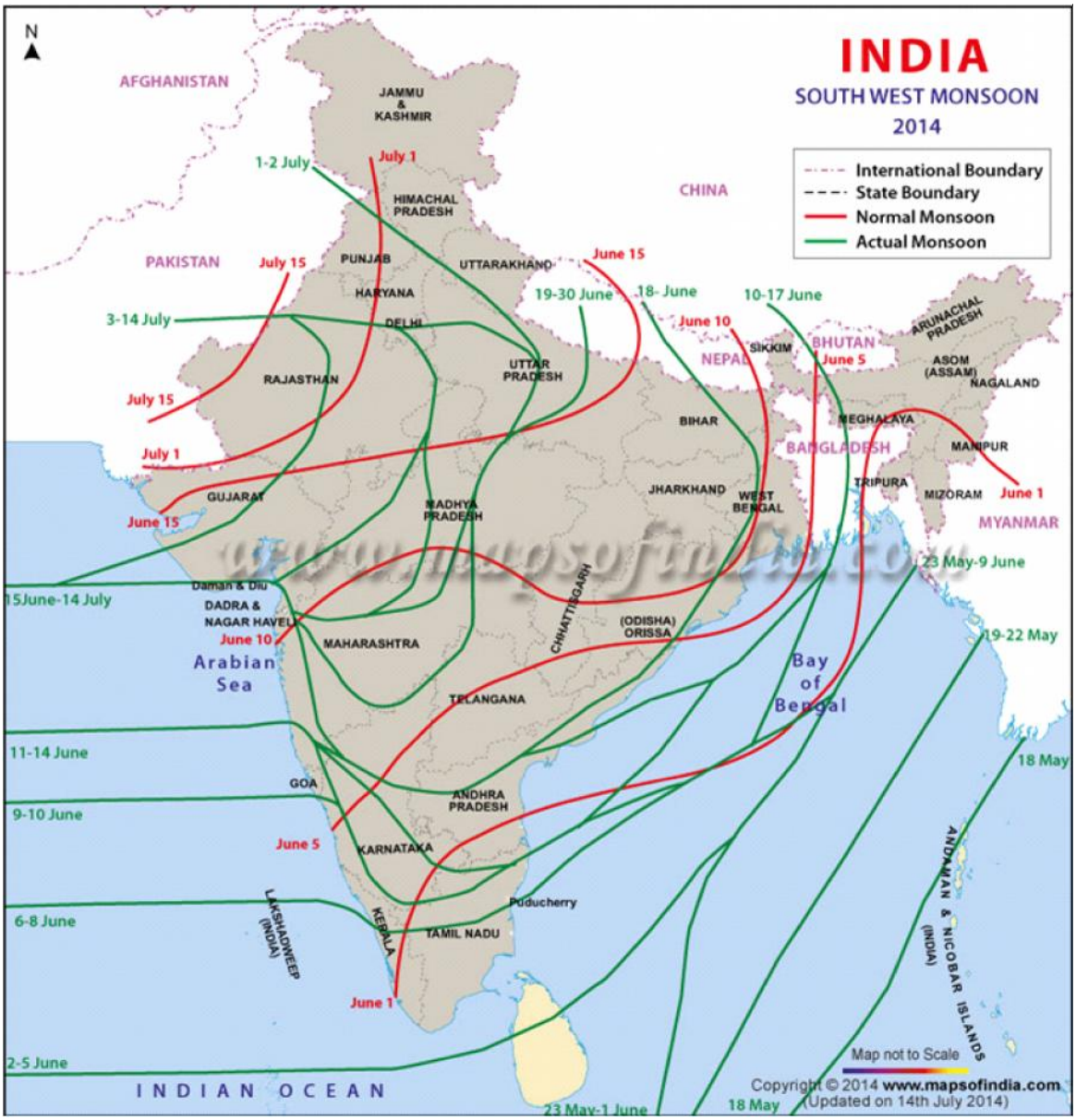
(a) Seasons on the NE Monsoons

1. January and February (Cold weather)
2. March to mid-June (Hot weather)

(b) Seasons of SW Monsoons

3. Mid-June to Mid-September (General rain)
4. Mid-September to December. (Retreating monsoon)

Progress of Monsoon



NATURE AND SIGNIFICANCE OF MONSOON RAINS

The seasonal character of monsoons is the most significant factor influencing the life of people in several ways. Odisha is predominantly an agricultural state. The agricultural seasons in Odisha are related with monsoons. The onset of monsoon marks the beginning of Kharif season, while the Rabi season begins with the retreat of south-west monsoons. The type of crop grown in a region is related in a big way with the amount of rainfall. Hence, humid crops such as rice and jute are cultivated mostly in the coastal regions, while the sub-humid or dry crops such as cotton, wheat and millet in the interior regions.

We are also affected considerably by the monsoonal vagaries. Water logging in low- lying areas and soil erosion in uplands are the outcomes of heavy monsoonal rains. The need for conservation of soil in higher elevation and the prevention of soil erosion, control of floods, and supply of required amount of water to the crops through irrigation during dry season is necessarily related to the peculiar seasonal character of monsoonal winds. The erratic nature of the monsoon rains occasions drought that occur once every, five years on an average. Droughts affect about 35 per cent of the country's area receiving less than 75 cm of rainfall on an average and with poor irrigation facilities.

Further, the irregularity of the monsoons has made Odisha one of the worst flood affected state in India. Heavy rainfall, cyclones, the overflowing of river waters, an elevation of the river beds, changes in the course of river and poor drainage facilities cause floods every year in about 25 to 50 per cent of the 2.42 crore hectare land identified as prone to floods.

CLIMATIC REGIONS

According to 'Koppens' classification' the climate of Odisha is the tropical savannah type (AW). As per 'Thornwaite's classification', Odisha comes under the moist-subhumid and dry sub-humid category, implying deficient winter rains. Odisha lies under tropical savannah type (AW) as per Trewartha's climatic regions.

AGRO-CLIMATIC ZONES IN ODISHA

Odisha can be divided into ten agro-climatic zones on the basis of soil, weather and other relevant characteristics. Its land can be classified into three categories, low (25.6%), and up-lands (40.8%) with various types of soil like red, yellow, red-loamy, alluvial, and coastal alluvial, laterite and black soil etc. with low and medium texture.

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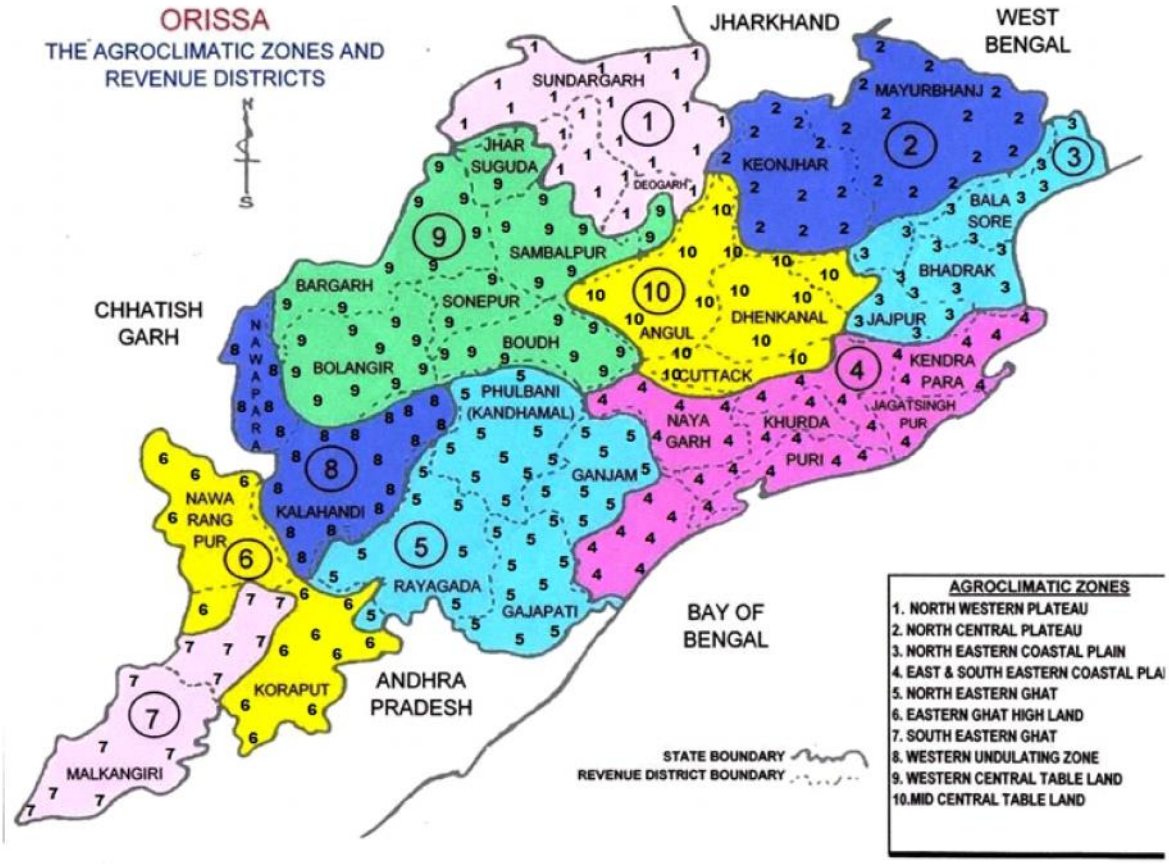
AGROCLIMATIC ZONES of ODISHA



TROPICAL CYCLONES

India has 29 states and Odisha is an important state located in the eastern part of India. Any natural calamity in Odisha has to be reviewed in relation to the geography of India specially flood and cyclone.

A cyclone is an area of low atmospheric pressure. The pressure is lowest at the centre. It is a storm system of great intensity. This closed air circulation is caused by atmospheric disturbances over and above the earth's surface, coupled with the earth's rotation which imparts a whirling motion to these disturbances. Cyclones are associated with destructive and violent disturbances, such as heavy squalls and torrential rainfall.

Winds in a cyclone in the northern hemisphere spiral inwards in an anti-clockwise direction, and in the southern hemisphere, in a clockwise direction. Depending on their area of origin and principal tracks followed, the cyclones can be either temperate/extra-tropical or tropical.

Tropical cyclones, the most destructive of nature's phenomena, are known to form over all tropical oceans, except South Atlantic and the South Pacific, during certain seasons. These cyclones have a thermal origin. They are believed to form in the Inter-Tropical Convergence Zone (ITCZ), a narrow belt at the equator, where the trade winds of the northern and southern hemispheres meet. ITCZ is a region of high radiation energy which supplies the necessary heat for the vaporisation of sea

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water into the air. This moist unstable air rises, generates convective clouds and leads to an atmospheric disturbance with a fall in surface atmospheric pressure. This causes a convergence of surrounding air towards this region of low pressure. The converging mass of air gains a rotary motion because of what is known as the Coriolis force caused by the rotation of the earth. However, under favourable circumstances, such as high sea-surface temperatures, this low pressure area can get accentuated. The convective instability builds up into an organised system with high speed winds circulating around the low pressure interior. The net result is a well-formed cyclone.

The ideal conditions for the development of tropical cyclones are-(i) quiet air, (ii) high temperature, (iii) highly saturated atmospheric conditions.

Structure

The centre is characterised by a patch of clear sky, called eye of cyclone. Here, because of the dry, descending air, quiet conditions prevail. Outwards of the centre, there are cirrus clouds and still outwards, dark nimbus clouds, which cause occasional torrential downpour and thunder storms. The right hand back corner of the cyclone gets heavy squalls and rainfall, but the left hand back corner gets clear weather as the trough passes. These cyclones are associated with destructive weather conditions, especially at the front of the cyclone. Also, these cyclones are highly unpredictable as the thermal effect over ocean and coastal areas changes very rapidly.

Tropical cyclones over the Bay of Bengal affecting Odisha occur in two distinct seasons, the pre-monsoon months of April-May and the post-monsoon months of October- November. On an average, in fact, almost half a dozen tropical cyclones form in the Bay of Bengal and the Arabian Sea every year, out of which two or three may be severe. Out of these, the stormiest months are May, June, October and November. Compared to the pre-monsoon season of May-June, when severe storms are rare, the months of October and November are known for severe cyclones.

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Chapter - 6

SOIL

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SOIL

Soil may be defined as a natural body developed as a result of pedogenic processes that take place during and after the weathering of rocks and in which plants and other forms of life are able to grow. It forms a loose superficial mantle covering the earth's crust, and is the seat of continual changes and transformations brought about by genetic factors. These changes and transformations make soil a dynamic body or entity.

Pedology and Edaphology

Soils or the pedosphere, are composed of air, water, mineral and organic material and organisms. They can be regarded as an amalgam of the lithosphere, the biosphere, the hydrosphere and the atmosphere

Soil is composed mainly of mineral matter together with a small amount of organic matter. In addition to these two, it contains water, some gases, and a large number of organisms. The soil, therefore, may be taken to comprise five groups of materials: (1) mineral matter, obtained by the disintegration and decomposition of rocks; (2) organic matter obtained by the decay of plant residues and animal remains, and microbial tissues; (3) water, obtained from the atmosphere in the form of rain, snow or dew; (4) air or gases, obtained partly from the atmosphere, and partly as a result of the reactions and microbial activity taking place in the soil; (5) organisms, both big (macro) like rodents worms, insects, etc., and small (micro) like bacteria, fungi, etc. which inhabit the soil in large numbers.

Functions of soil

Soil has a three-fold function to perform Physical, chemical and biological. One of the important physical functions of soil is to act as a mechanical support for the growing plant. The plant is able to stand erect because of the hold exerted by the soil on plant roots. The roots are ramified and they are thus anchored in the soil mass. The soil acts as reservoir of water and air. The plants absorb water through their roots from this reservoir, and the roots breathe in oxygen from the air stored in soil mass. The soil also stores the suns heat, and supplies it to the growing plant.

Soil Morphology

Colour

The soil profile is not uniform throughout its depth. It contains two or more horizons, each possessing certain morphological features that distinguish one from the other. The same morphological features that differentiate the various horizons also characterise a soil profile and help to differentiate it from others. The more common morphological features are colour, texture, structure, constitution, new growth and inclusions.

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The colour of the soil is one of the most outstanding morphological features that attracts one's attention. Very often the various horizons are differently coloured. The variation in colour of the different horizons serves as one of the factors that leads to the recognition of different soil types and genetic groups. Sometimes the colour of soil in one and the same horizon is not uniform. There are a number of recognised soil colours. Some of the more important soil colours are black, red, yellow, brown, grey and white.

The black colour of a number of soils is mainly due to the accumulation of humus or decaying organic matter. The presence of humified organic matter is mainly responsible for the black colour of chernozens and other allied soils. Finely divided magnetite and oxides of manganese and titanium, if present in sufficient quantities, also impart a black colour. In arid and semi-arid regions there are, at times, patches of black soil known as black alkali. The black alkali soils are usually infertile because of the presence of sodium carbonte and other harmful salts.

The colour of the red soils is mainly due to the presence of iron oxide in the form of ferric oxide. Red soils are usually found in tropical countries as high temperature seems to be necessary for their development. The soils of the most tropical regions e.g. laterites, possess red and orange colours which are due to the presence of various hydrated iron oxides.

Yellow soils also owe their colour to iron oxide. The iron oxide in these soils is more hydrated than in the red soils.

The colour of the grey soils is due to the removal of bases like iron from the soil mass by leaching as in the A horizon of a podsol soil. Grey soils are usually formed in humid regions. The soils of marshes and other low lying places where anaerobic conditions prevail are also grey in colour.

White colour usually indicates a sand or sandy soil. A high content or silica silicic acid or calcium carbonate also imparts a white or whitish colour to the soil. In arid regions the presence of salts like sodium chloride and sodium sulphate in the form of an incrustation also gives rise to whitish soils.

Some soils have varieated colours brought about mainly by the alternate oxidation and reduction of iron and manganese compounds and their hydrated products. During oxidation these compounds acquire a red, brown or black colour. During reduction when they are changed to the ferrous and manganous state they acquire a yellow, blue or green colour.

The nature of soil colour has a very marked effect on soil temperature. In general dark coloured soils absorb more heat than light coloured soils when they are dry. In moist soils, however, this relationship does not hold good as evaporation of moisture plays a greater part in controlling soil temperature.

Soil texture

Texture denotes the size of the individual soil particle. Very often the way in which the particles of various sizes have distributed themselves in a profile leads to the formation of definite horizons, each containing particles of a particular size. It results in the development of a texture profile, wherein the various horizons are differentiated from one another by the relative amounts of coarse and the fine particles they contain. The mechanical removal of finer particles from the surface layer tends to make the horizon of eluviation coarser. The texture becomes more and more heavy with depth, and it reaches maximum heaviness in the horizon of illuviation. This is more clearly seen in soils formed in situ.

Soil structure

All the soil particles do not exist in the soil as individual grains. A large majority of them are grouped together to form compound particles known as aggregates. The manner in which the individual grains and aggregates are arranged in the soil mass is known as structure. Soil structure is one of the prominent morphological features which helps to differentiate one soil type from another. Every soil type possesses a structure characteristic of itself developed under a certain set of climatic and other environmental conditions.

Soil constitution

Constitution indicates the degree of compactness or looseness to which the soil material is built during the process of soil development. It gives an idea of the resistance that a soil offers to the penetration of foreign materials.

Soils of Odisha

Soils of Odisha are mainly developed by the relief, parent material and climate. The biotic features, mainly the natural vegetation follows the climatic pattern. Soils of Odisha have been divided into 8 broad soil groups, taxonomically these 8 broad groups of soil come under 4 orders of 10 sub orders and 18 great groups.

Soils of Odisha influenced by climate, topography and parent material are the most heterogeneous for which the average productivity of many crops is low. Identification of specific soil problems and their efficient management would accelerate the crop productivity.

1. Red soils

   The main features are coarse texture, single grained to weakly granular structured surface soil, highly porous with low available water holding capacity. These put severe limitations for rainfed farming. These soils are non-saline and do not contain any lime kankar or free carbonate. The red colour is due to presence of iron oxides. These soils are moderately acidic and are generally deficient in nitrogen, organic matter and molybdenum. Boron deficiency symptoms have been observed in vegetable crops. The added phosphorus is generally fixed in these soils due to presence of free iron and aluminium oxides.

   Red soil covers about 7.14 m. ha of lands and being the highest coverage of all soil groups of the state, extend to the districts of Koraput, Rayagada, Nawrangpur, Malkanagiri, Keonjhar, Ganjam, Kalahandi, Nuapada, Bolangir, Dhenkanal and Mayurbhanj. The soils are strongly to moderately acidic with low to medium organic matter status and poor water retentive capacity. These soils are deficient in nitrogen and phosphorus. Presence of excess amounts of oxides of iron imparts red colours to the soil.

2. Laterite and lateritic soils

   These soils contain lateritic mass within control section of the profile. The lateritic mass is characterized by compact to vesicular sometimes honey-combed structure, composed essentially of a mixture of hydrated oxides of iron and aluminium with small amount of manganese and titanium oxides and quartz as a necessary diluent. These soils are highly permeable and are poor in nitrogen, phosphorus, potassium and calcium. They are generally acidic in nature.

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Lateritic soils occupy 0.70m. ha of lands in the districts of Puri, Khurda, Nayagarh, Cuttack, Dhenkanal, Keonjhar, Mayurbhanja and Sambalpur. These soils are loamy sand to sandy loam in the surface having hard clay pan in the subsoil, crusting is its problem in upland laterite.

3. Red and yellow soils

They occur as a catenary association in undulating and rolling terrains which differ in depth, texture, colour and cropping systems. Soils of uplands are comparatively coarser in texture having red and yellowish red colour, shallow in depth and are well drained. Ferrogenous nodule are invariably met within these soils. Soils are comparatively more acidic than those of lower reaches. The soils of low lying areas, especially of bottom land situation are formed on alluvial deposits. These are of fine texture, deep and show pale yellow greyish and olive shade of colour.

The cropping systems followed in yellow soils is rice followed by pulses/oilseeds with residual soil moisture or supplementary irrigation and that followed in upland red soils is monocrop of pulses/oilseed/millets.

These soils occupy 5.5m ha of lands being the second highest in area. These soils occur in the district of Sambalpur, Bargarh, Deogarh, and Sundargarh. Mixed red and yellow soils occur as in undulating and rolling terrains which differ in depth, texture, and colour. The soils are moderately shallow in depth and coarse-textured.

4. Coastal salt affected alluvial soils

Alluvial soils with high total soluble salts (Electrical conductivity greater than 4 mhos/cm) are included under this group. The salinity of soil may be due to littoral deposits or the incursions of brackish tidal water. The salts are mainly composed of chlorides and sulphates of sodium, magnesium and to a lesser extent of calcium and potassium. Bicarbonates and carbonates are rarely found. Soils in lacustrine sediments of the lake Chilka also get affected by salts due to flooding of brackish lake water during monsoon and a build-up of subsoil salinity due to high ground water table under low-lying situation.

These soils occur along the coastal belt of the state in a narrow strip extending 5-25 km inward. The salinity occurs due to littoral deposits of estuarial intrusion of brackish tidal water from sea through creeks. Nearly 0.254m ha. Of saline soils are distributed in the districts of Balasore, Bhadrak Jagatsinghpur, Kendrapara, Puri, Khurda and Ganjam. Saline soils are rich in soluble salts of chloride and sulphate in conjunction with sodium and magnesium.

5. Deltaic alluvial soils

These soils have variable texture ranging from coarse sands to clays, depending upon the geomorphology of flood plain and the type of alluvium carried by the flowing river. The delta areas of the state show four well defined divisions from north to south such as (a) north Balasore containing sandy or sandy loam soil, (b) delta of Baitarani and Brahmani with soil varying from clay loam to stiff clay, (c) delta of Mahanadi with soils stratified into clay, silt sand and grets and (d) Rushikulya delta which is more sandy in nature. These soils are generally fertile, but soils with low nitrogen and phosphorus are also found. The sandy alluviums of river Subarnarekha are deficit in potassium too.

Those soils cover 0.67m. ha of lands and occur in the deltaic regions of the rivers such as Mahanadi, Brahamani, Baitarani, Subarnarekha and Rushikullya in the districts of Balasore, Bhadrak, Jajpur, Kendrapara, Jagatsinghpur, Cuttack, Puri, Gajapati and Ganjam. Textural class of the soil varies from coarse sand to clay and is mostly dependent on geomorphology of the flood plain and the type of alluvial material carried by river water.

6. Black soils

These are formed due to specific lithology or topography. Parent rocks of basic granulites, calci-gniess, pyroxenites and granodorites are conducive to formation of black soils. These rocks invariably contain plagioclases in appreciable amounts, which on weathering makes the soil environment rich in calcium. A lime kankar zone at some depth in the profile and free carbonates are usually present. Soils exhibits deep and wide cracks in summer seasons. The texture is clay and the structure is angular blocky. The water infiltration in these soils is slow and erosion on upland situation is severe. Soils are low to moderate in nitrogen and potassium, rich in calcium and respond 10 nitrogen and phosphorus. Soils are moderately alkaline (pH 7.5 to 8.5).

There are no regular occurrence of black soils in the state. These soils occur sporadically in the districts of Puri, Ganjam, Malkangiri, Kalahandi, Nuapada, Bolangir, Sonepur, Boudh, Sambalpur, Bargarh and Angul covering an area of 0.96 m. ha. Of lands. The black colour of the soil is due to presence of titaniferous magnetite, bitumins etc. These soils are formed due to weathering of basic rocks in the low lying areas.

7. Mixed red and black soils

Catenary formation of such soils are encountered in areas of predominately red soils. Red soils generally occur on upland ridges, while black soils are found on lower topographic situations, due to enrichment of calcium on their exchange complex, fine textured colluvium and alluvium. These soils occur as association of both red and black soil together in which black soil occurs in patches within the predominant red soil. The red and black soils are so intermixed that red soils are found in upper ridges whereas, black soils occur in lower ridges. The soil occupies about 0.16 m. ha of lands in the western districts of Sambalpur, Bargarh, Sonepur and Bolangir.

8. Brown forest soils

These are mainly brown coloured, formed in association with forest growth. The organic matter is moderate to high in these soils. These are fertile, slightly acidic and are suited for horticultural crops in higher elevations.

These soils being associated with forest areas are distributed in the districts of Phulbani, Kandhamal, Rayagada and parts of Ganjam and Nayagarh and cover about 0.17 m.ha. These are brown to grey brown in colour, light texture and acidic in reaction. Organic matter and nitrogen content of the soils are medium to high.

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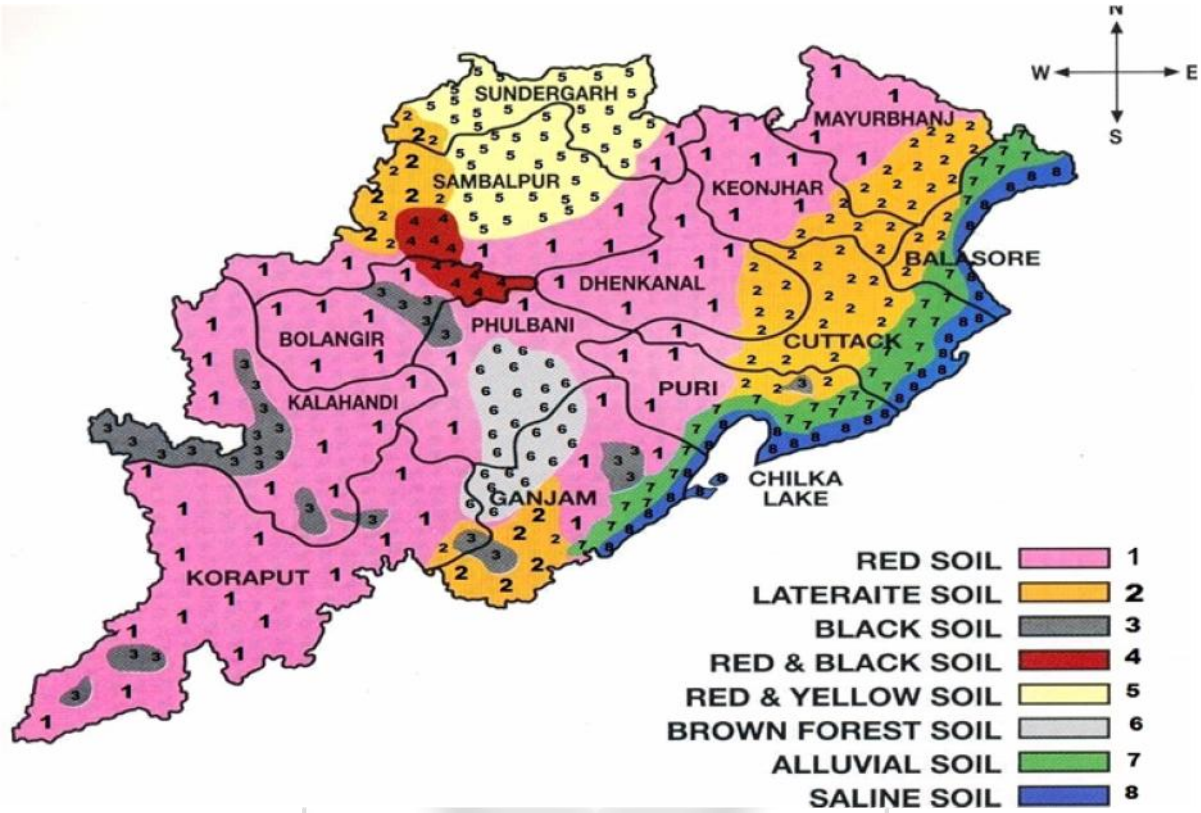
Soil Distribution in Odisha



Problem Soils and their Management

More area can be brought into cultivation if the problematic soils are properly reclaimed and managed.

Problem soils

The problem soils of Odisha can be grouped into three, classes, viz., 1. Upland, low fertile, low water retentive acidic soils, 2. Low land soils posing iron toxicity problems and 3. Coastal salt affected soils.

1. Low fertile acidic soils

The red and laterite and lateritic group of soils generally belong to this category which constitute about two-third of the total areas in the state. These soils have been developed due to intensively weathered parent material of varying composition of sandstone, quartzite, granite gneiss either in situ or over transported material. Soil developed due to ferrogenous sandstone belonging to the Benchmark soils of Bhubaneshwar series are acidic in nature and medium in organic carbon content. The texture of these soils varies from sandy loam to sandy clay loam with depth. The available water holding capacity of these soils is low.

Soils are highly permeable and susceptible to droughts during frequent dry spell in the rainy season emergence of seedling is obstructed due to a shallow crusting developed after beating action of a rain because of cementation of colloidal iron oxides.

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Soils have low nutrient retention capacity and are strongly acidic. Soils contain low available nitrogen, phosphorus and potassium. Productivity is low under the farming system, followed by local farmers.

2. Low land soils posing iron-toxicity problems

In the landscape of rolling topography, soils located on valley slope, toe-slope lands receive washing of lateritic constituents rich in iron due to seepage. Rice crops grown on such soils show bronzing due to iron toxicity which get accentuated under waterlogged situations developed due to underlying clay substratum that restricts vertical drainage.

3. Coastal salt affected soils

These soils are developed along sea coasts constituting 0.4 m hectares. Otherwise salt free, alluvial soils get salt affected because of tidal incursions of brackish sea water and breach of salt embankment through high tidal bore during cyclones. In the districts of Puri and Ganjam, salt affected soils have originated because of flooding of lake Chilka.

In rainy season, deep standing water conditions prevails in the tract. But in the off monsoon period of November to May, the soil profile is progressively recharged with salts through capillary rise to sub-soil salts due to desiccation. Practically the land remains fallow during the period and therefore the areas are mono cropping.

B. Management

General measures that are followed in the reclamation of these soils are mentioned here.

1. Acidic soils can be managed by the application of organic manures and liming material.
2. Improving drainage facilities by constructing deep drains around the field, checking lateral seepage water by constructing check embankments across the slope reduces the iron toxicity.
3. The sodium content of saline soils can be removed by flooding and by growing resistant varieties.

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Chapter - 7

NATURAL VEGETATION & FOREST

7

NATURAL VEGETATION & FOREST

FOREST

As per the report of the Forest Survey of India using remote sensing techniques, the forest cover in the State is 50354 sq. kms of which 7,073 sq. kms is very dense forest. The moderately dense forest extends over 21,394 sq. kms while open forest is over 20,388 sq. kms. The forest cover in the State constitutes 31.38% of the geographical area. Besides this, there exists tree cover outside the forest over 2.56% of the geographical area of the State. Thus the forest and tree cover in the State is 34.90% of the geographical area of the state.

The Forest Department has been constantly endeavouring to protect the forest areas and regenerate the degraded forests. This is attributed to both afforestation and protection of forest through the successful participatory Forest Management efforts. Based on the relief, rainfall and vegetation types,the forests of Odisha are divided into the following types:

(i) Northern Tropical Semi-evergreen Forests :

These occur in the lower hills and valleys above 600 m elevation in the forest divisions of Mayurbhanj, Dhenkanal, Athgarh, Puri, Nayagarh, Parlakhemidi, Koraput and Kalahandi. The important tree species are: Arjun, Mango, MankarKendu (Diospyrosembryopteris), Champak, Rai, Manda and Nageswar.

(ii)Tropical Moist Deciduous Forests also known as Monsoon Forests

These occur in the lower elevations in Mayurbhanj and Keonjhar districts and the districts bordering on Madhya Pradesh and Andhra Pradesh. The top canopy is formed by Sal (Shorearobusta) and its allies Asan, Piasal, Kurum, Kangra and Dhawra and Daba bamboo (Bamboosaarundinacea).

(iii) Tropical Dry Deciduous Forests:

They occur in the drier central and western areas in parts of Balangir, Kalahandi, Sambalpur, Khariar, Deogarh and Gobindpur divisions. Teak instead of Sal,and Salia bamboo (Dendrocalamusstrictus) instead of Daba bamboo predominate in these forests.

(iv) Tidal Mangrove Forests:

These are limited in extent, scattered and confined to the seacoast,especially in BhitarKanika (Balasore) and the Mahanadi delta. The characteristic tree speciesare Karika (Bruquiera), Sundari (Heritiera), Bani (Avicennia), Rai (Rhizophora), Guan (Exocaria), etc.As Hental (Phoenix paludosa) grows here abundantly in clusters, the mangrove forests are locallycalled ‘Hental van’ or Hental forests. Forests are a major constituent of the state’s natural resources in the form of timber, firewood and a large number of profitable forest products like sabai grass, lac, resin, catechu, tassar silk,

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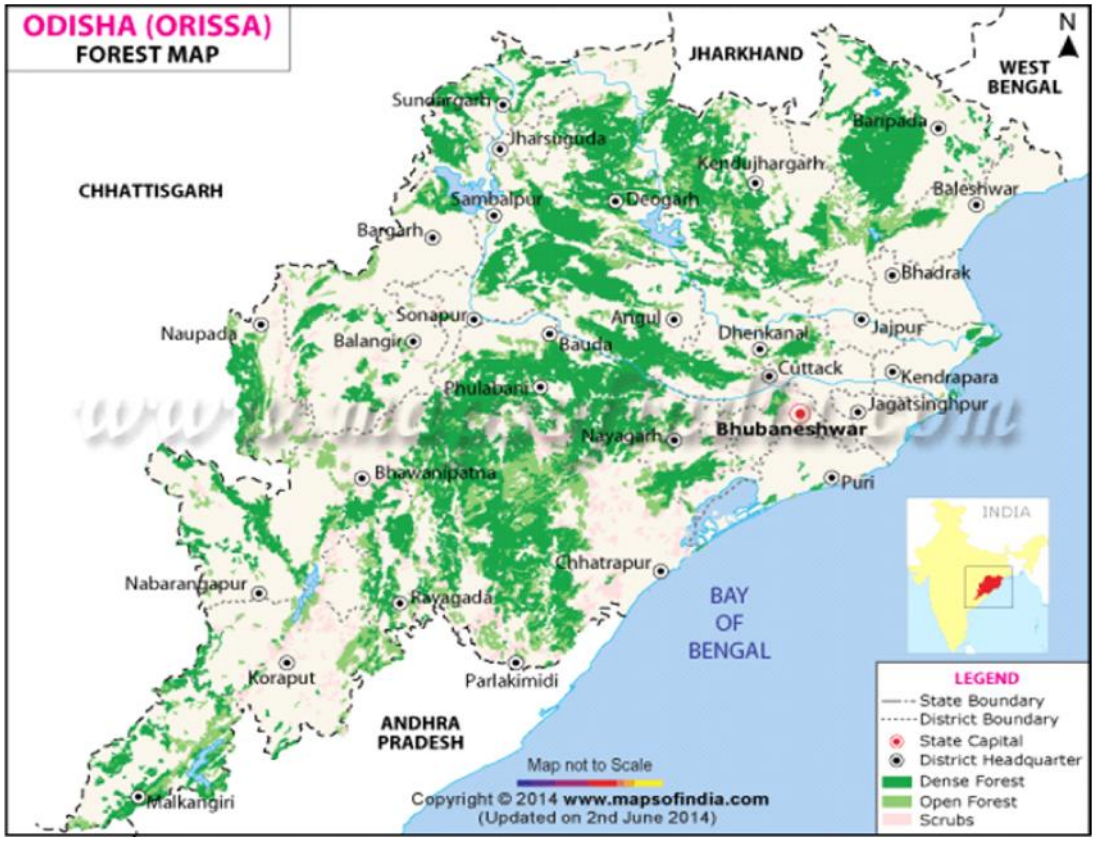
honey,natural dyes, etc. The valuable timber species are Teak, Seasum or Rose wood, Piasal, Kassi,Kurum, Arjun, Gambhari, Giringa and such other varieties of polishable wood that are used for furniture,and Sal, Asan, Dhau, Bandhan, Kangra, etc. which are hard and utilised in various construction works. Kendu (Diospyrosxylocarpus) leaves which are used for wrapping bidi constitute a profitable source of revenue as they are largely in demand all over the country. Bamboo is of extensive utility not only in the life of the common man but also as essential raw material for paper industry. It is used in the paper mills of the state and supplied outside, especially to West Bengal. Sabai grass is also used for making paper pulp, but mostly for rope making. Sericulture, undertaken in the forest areas,provides a good source of income to the people. Certain parts of the forest, for example the Gandhamardan hill in Balangir, abound in medicinal plants and herbs. Nux vomica which grows widely in most forests and Rauwolfiaserpentira, which grows in the jungles of the south are common examples.

Forest Cover in Odisha



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Chapter - 8

WILDLIFE

8

WILDLIFE

Animals

Project Tiger, Similipal, which was launched as a part of the national programme in 1973 with only 17 inmates to start with; today their number stands at 40 wildlife census 2015. The Project Tiger covers an area of 850 sq. km in the heart of the 2750 sq. Km wide Similipal Reserve Forest. The Odishan tiger belongs to the race of panther (Pantheratigris —Odia, Badabagha), the other reported species like leopard (last reported in 1960 from Dhenkanal) and cheetah are by now extinct. The Nandankanan Biological Park is famous for its white tigers.

Historically, the pride of place among the wild animals of Odisha goes to the elephant. In the past Odisha used to have an elephant wing in its army and the historic royal dynasties took pride in calling themselves 'Gajapati' or the lord of elephants. Odisha's famed elephants are found in the jungles of Mayurbhanj, Keonjhar, Dhenkanal, Puri (near Balugan), Ganjam and Sambalpur districts. The WildLife Sanctuary at Chandaka provides a natural forest abode to elephants. There are elephants in the Mahanadi Baisipali Sanctuary near Nayagarh and Ushakothi Sanctuary on the National Highway No.6 some 40 km from Sambalpur. The latter offers shelter to bisons (gayala) in particular and any visitor to the sanctuary is sure to meet a herd of them. The Irrawadi dolphin (bhuasunimachha) and the gangetic dolphin (sisumara) are found in the Chilika and the rivers respectively.

Birds

The bird kingdom of Odisha, vast, varied and colourful, offers a most attractive sight. Odisha has an almost inexhaustible treasury of folk songs and folklore poetising most of the birds found.

Reptiles

Among the reptiles the most endangered species today is the crocodile on account of the high price offered for its skin. Odisha has all the three species of crocodile, namely the Gharial, the estuarine crocodile (Baula) and the marsh crocodile and sanctuaries have been set up for their preservation and growth. The Gharials which are found only in the Mahanadi and its tributaries are reared in the sanctuary at Satkoshia on the river Mahanadi covering an area of 795.5 sq km. There is also a small crocodile sanctuary at Ramirth inside the Similipal forest.There are two important species of turtle commonly found in Odisha— the Green Turtle, a big marine species attaining a length of 1.2 metres and weighing between 135 to 180 kg each found in the Chilika and the Pacific or Olive Ridley Sea Turtle (Lepidochelysolivacea), a migratory species. The latter come in thousands from far off parts of the Pacific coasts during winter to lay their eggs at Gahiramatha and Satabhaya in BhitarKanika. The place where these turtles lay eggs has come to be known as'Arribada' (a Spanish word meaning breeding ground).

WILDLIFE OF ODISHA

The State of Odisha has a geographical area of 155,707 sq km. The recorded forest area is 50354 sq. kms. But the actual forest cover is 47,033 sq.km. as per the State of Forest Report of Forest Survey of India. In order to provide proper protection to the wildlife and their habitat, a total of 18 sanctuaries (Protected Areas) including Gahirmatha (Marine) Wildlife Sanctuary, one National Park (Bhitarkanika), one proposed National Park have been notified under the provisions of Indian Wildlife (Protection) Act, 1972.

These Protected Areas constitute 10.37% of the total forest area and 4.1% of the total geographical area of the state. Besides, one Tiger Reserve (Similipal), one Biosphere Reserve (Similipal), one closed area (Chilika), one Game/Wildlife Reserve (Balipadar - Bhetnoi), one Zoological Park and 8 Deer Parks (mini zoos) have been notified for both in-situ and ex-situ conservation and management of wildlife.

The state has the singular distinction of having 3 mass nesting beaches of endangered Olive Ridley sea turtles including world's largest nesting ground of olive ridley seaturtle, Lepidochelysolivacea. It has many natural wetlands including largest wetland of Asia (Chilika)now designated as a Ramsar site. The state is implementing several research and conservation projects viz;

a) The Project Tiger (1972-73),

b) Integrated Crocodile and Sea Turtle Project (1975-76),

c) Project Elephant (1991-92),

d) Aquatic Bird Project (1992- 93),

e) Blackbuck Project (1994-95).

NATIONAL PARKS AND WILDLIFE SANCTUARIES OF ODISHA

1. Similipal Wildlife Sanctuary

- Located in the Mayurbhanj district Similipal with its dense green forests, hilly terrain, broad open valleys, plateaus, grass lands and rich bio-diversity has the unique distinction of being a Tiger Reserve, a National Park (proposed), a Wildlife Sanctuary, an Elephant Reserve and a Biosphere Reserve.
- Similipal is the richest watershed in Odisha feeding several perennial rivers such as Budhabalanga, Khadkei, Khairi-Bhandan, Westdeo, Salandi etc. Gorgeous Barheipani (400 mt.) and Joranda (150 mt.) waterfalls are of great attractions. The rich bio-diversity, the physical and topographical features of Similipal constitute a unique and delightful destination for scientists, nature lovers, students and tourists.

2. Bhitarkanika Wildlife Sanctuary

- Located in the district of Kendrapada, Bhitarkanika harbours rich and unique bio-diversity which has been declared as a wildlife sanctuary and also a National Park.
- The area is surrounded by rivers such as Brahmani, Baitarani and Dhamara and is criss-crossed by several creeks and creeklets. The area supports rich bio-diversity.

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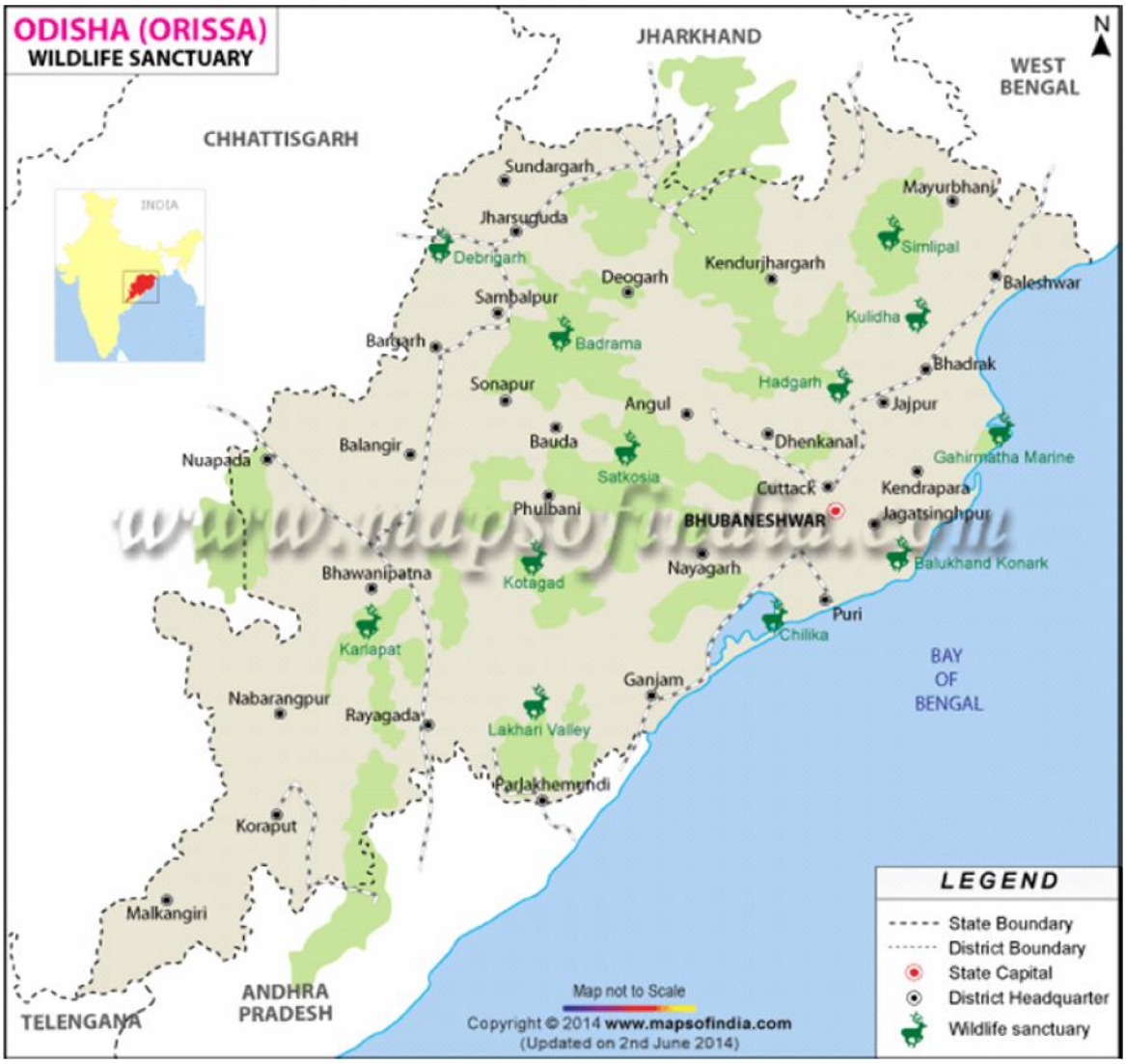
- The sea beach, borderding the sanctuary attracts thousands of olive ridley sea turtles for mass nesting/egg laying during the winter months (January to April). Bhitarkanika mangrove ecosystem is unique of its kind and it is a best reptile refuge in the entire country.

Wildlife Sanctuary in Odisha



3. Satkosia Gorge Wildlife Sanctuary

- Satkosia gorge is a unique feature in geomorphology in India. Here Mahanadi has cut right across the Eastern Ghats and has formed a magnificent gorge.
- Located in the districts of Angul, Cuttack, Nayagarh and Boudh, Satkosia Gorge Sanctuary (795.52 sq. km.) with sylvan beauty and excellent natural features is an attractive destination for scientist and nature lovers.
- Major attraction of the sanctuary is the Satkosia gorge, river Mahanadi, the Gharial Research and Conservation Unit at Tikarapada, hill slopes, various tracking routes and boating.

4. Hadagarh Wildlife Sanctuary

- Hadagarh sanctuary in the district of Keonjhar and Mayurbhanj is close to Hadagarh reservoir of Salandi dam.
- The Baula hill range lying on the east and west of Salandi river, the valley occupied by the reservoir and its catchment are the main features.

5. Nandankanan Wildlife Sanctuary

- Amidst lush green forest along the banks of Kanjia lake, lies Nandankanan Zoological Park which together with lake and Botanical garden is declared as sanctuary (4.4 sq. km.).
- It has an open Lion Safari and first zoo in the world.

6. Baisipalli Wildlife Sanctuary

- Adjacent to Satkosia gorge and located in the Nayagarh district, the Baisipalli wildlife sanctuary is having similar and contiguous habitat features as the Satkosia gorge sanctuary.

7. Kotagarh Wildlife Sanctuary

- Kotagarh wildlife sanctuary located in the Baliguda subdivision of Kandhamal district is rich in biodiversity. A wooden bungalow at Belghar attracts many nature loving visitors.

8. Chandka-Dampara Wildlife Sanctuary

- Chandka-Dampara Sanctuary (175,79 sq.km.), This small and attractive sanctuary with undulating topography presents a fascinating rejuvenated forest and rich bio-diversity. The natural water body and forests provide suitable nesting ground for 82 species of migratory and resident birds.

9. Khalasuni Wildlife Sanctuary

- Khalasuni's undulating topography ranging from 223 mt. to 750 mt. offers a wide ranging scenic beauty of wild virgin forests.

10. Balukhand-Konark Wildlife Sanctuary

- This sanctuary is situated at convenient location along sea coast between Puri and Konark. The Puri-Konark marinedrive passes through it.

11. Kuldiha Wildlife Sanctuary

- This sanctuary is located in the district of Balasore and is blessed with a charming forest and a variety of wildlife and a number of birdspecies.

12. Debrigarh Wildlife Sanctuary

- The combination of dry deciduous mixed forests with rich wildlife, Hirakud reservoir, attractive topographical features are the important features of Debrigarh wildlife sanctuary.
- The Hirakud reservoir attracts large number of migratory birds during winter. The forest area is ideal habitat for Chousingha.

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13. Lakhari Valley Wildlife Sanctuary

- This sanctuary, located in the district of Gajapati is rich with tropical mixed deciduous forest, hills, perennial water sources and a variety of wildlife. This sanctuary can be approached from Berhampur, Taptapani (famous for its hot water spring) and Chandragiri.

14. Chilika (Nalaban) Wildlife Sanctuary

- Chilika, the largest brackish water wetland (1000 sq. km approx.) in the country is situated in the eastcoast of the state in the district of Puri, Ganjam and Khurda.
- A vast and picturesque lagoon/lake is famous for rich bio-diversity including the migratory birds and has been acknowledged as a "Ramsar site". Besides this wetland provides home for endangered Irrawady Dolphin.

15. Badarama Wildlife Sanctuary

- Badarama sanctuary also popularly known as Usakothi, located in the district of Sambalpur.

16. Sunabeda Wildlife Sanctuary

- Situated in the western fringe of Odisha in the newly created Nuapada district, this sanctuary covers 600 sq. km.

17. Karlapat Wildlife Sanctuary

- This small but beautiful sanctuary is located in Kalahandi district covering a dense patch of lush green dry deciduous forest. A beautiful waterfall near this river on the outskirts of this sanctuary called Phulljharan has been developed.

18. Gahirmatha (Marine) Wildlife Sanctuary

- Gahirmatha is the only marine sanctuary of Odisha adjoining Mahanadi delta. It has been created to protect the endangered olive ridley sea turtles, dolphins and other marine fauna. Gahirmatha is known in the world oven as a unique mass-nesting site (rookery) of the olive ridley on the calm sandy shores of the Bay of Bengal.

National Parks

Sl.No	Name of the NP	District	Area (Km. Sq)
1.	Bhitarkanika	Kendrapara	145.00
2.	Similipal	Mayurbhanj	845.70

Wildlife Sanctuary

Sl.No	Name of the NP	District	Area (Km. Sq)
1.	Badrama	Sambalpur	304.03
2.	Baisipalli	Nayagarh	168.35
3.	Balukhand-Konark	Puri	71.72
4.	Bhitarkanika	Kendrapara	672.00
5.	ChandakaDampara	Khurda-Cuttack	175.79

Sl.No	Name of the NP	District	Area (Km. Sq)
1.	Chilika(Nalaban)	Puri	15.53
2.	Debrigarh	Bargarh	346.91
3.	Gahiramatha(Marine)	Kendrapara	1435.00
4.	Hadgarh	Keonjhar	191.06
5.	Karlapat	Kalahandi	147.66
6.	Khalasuni	Sambalpur	116.00
7.	Kotagarh	Kondhmal	399.05
8.	Kuldiha	Balasore	272.75
9.	Lakhari Valley	Gajapati	185.78
10.	Nandankanan	Khurda	4.40
11.	Satakosia Gorge	Angul, Baudh,Cuttack	795.52
12.	Similipal	Mayurbhanj	2200.00
13.	Sunabeda	Nuapada	500.00

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Chapter - 9

AGRICULTURE

9

AGRICULTURE

Agriculture plays a dominant role in the economy of the State like Odisha. While the contribution of Agriculture and Animal Husbandry to the Net State Domestic Product is abysmally low.

Agriculture in Odisha continues to be characterised by low productivity due to traditional agricultural practices, inadequate capital formation and low investment, inadequate irrigation facilities and uneconomic size of holding. Nearly 62% of the cultivable land is rain fed and exposed to the vagaries of monsoon. Most of the small and marginal farmers do not have the means to make adequate investment in agriculture due to poverty.

Agriculture is a complex and multidimensional enterprise. Its development depends on various factors like agro-climatic conditions, technology, inputs, system of land holdings and other social-economic factors. During the Seventh Plan, several new programmes were launched for the development of Cereals, Pulses, Oilseeds, and Jute etc. These programmes continued during the Eighth and subsequent Plan periods with the objectives of improving the level of production and productivity. Priority was laid on crop planning, productivity,expansion of area under cash crops, Cropping intensity, use of fertilisers, pest management,marketing and use of modem agricultural implements and farm machinery.

Recognising the importance of this sector to the State's economy, the State Government have come up with a comprehensive Agriculture Policy accordingly. The objective of the above policy was pursued vigorously during the Tenth Plan to make Agriculture sector one of the growth engines for accelerating the pace of development of the State. The State Agriculture Policy 2013 has been formulated to make agricultural growth sustainable and inclusive. It aims to bring a shift from the present level of subsistence agriculture to a sustainable commercial agriculture. The policy is structured to promote and enhance productivity, seed replacement, quality planting materials, Integrated Nutrient Management, Integrated Pest Management, water management, farm mechanization and technology transfer, crop substitution, horticultural crops, poultry, diary and fisheries to augment the income of the farmers.

The main objectives set out in the State Agriculture Policy 2013 are as follows:

(i) To enhance the status of Agriculture from the present level of subsistence agriculture to a profitable and commercial venture, so that young persons can accept agriculture as a means of self-employment.

(ii) To generate adequate employment opportunities.

(iii) To adopt integrated programmes for problem soils such as water logged areas, areas with soil erosion, dry/rain fed areas, area under shifting cultivation, waste land, saline and alkaline soil etc.

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(iv) To create entrepreneurship in the field of agriculture and horticulture.

(v) To create skilled labourers for management of modern agriculture.

(vi) To help mechanisation of agriculture to increase productivity.

(vii) To establish Agro-based Industries and Food Processing Industries.

(viii) To provide irrigation facilities to 50% of cultivable land through completion of incomplete irrigation projects and promotion of individual and group enterprise.

(ix) To promote private enterprise in the marketing of agricultural produces.

(x) To identify and promote thrust crops in different agro-climatic zones of the state.

(xi) To reorient agriculture towards export.

The objective was to achieve 4% sustainable annual growth in agricultural production through better management of natural resources and scientific management of crops. It also aims at doubling farmers' incomes. The following sectorial plan strategies have been envisaged for realizing these objective.

- Substantially improve irrigation potential and its utilization.
- Improve water management, rain water harvesting and watershed development.
- Reclaim degraded land and focus on soil quality.
- Bridge the knowledge gap through effective extension.
- Diversify into high value outputs, fruits, vegetables, flowers, herbs and spices, medicinal plants, bamboo, bio diesel etc., but with adequate measures to ensure food security.
- Mixed farming to be encouraged and in farm animal husbandry and Fishery activities to be promoted.
- Provide easy access to credit at affordable rates.
- Improve the incentive structure and functioning of markets.
- Refocus on land reform issues.

Types of Agriculture and Problems

The types of agriculture practised in Odisha are -

1. Shifting Cultivation
2. Sedentary Farming
3. Subsistence Agriculture
4. Commercial Agriculture
5. Plantation Agriculture
6. Mixed Farming
7. Dairy Farming
8. Fruits or Vegetable Farming

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1. Shifting Cultivation:

This type of cultivation is seen in the tribal regions. The tribal generally burn the vegetation cover of a particular area on the sloping side of the hill and after the rainfall they cultivate the land. When the fertility capacity of the land is reduced the tribal people shift from that place to a new place. Such type of cultivation is known as Shifting Cultivation. Different names are given at different places. In Odisha such type of cultivation is known as PODU cultivation. In South America and Indonesia such type of cultivation is known as MILPA and LADANG respectively. Due to burning of forest, serious problem like soil erosion and the less amount of rainfall result due to deforestation.

2. Sedentary Agriculture:

Such type of agriculture is seen in the coastal regions, river basin and undulating plateau. A particular land is cultivated for years together and paddy, maize, sugarcane etc are raised.

3. Subsistence Agriculture:

Subsistence agriculture is self-sufficiency farming in which the farmers focus on growing enough food to feed themselves and their families. The output is mostly for local requirements with little or no surplus trade. This condition is prevalent all over the state.

4. Commercial Farming:

Large scale scientific cultivation with high yielding varieties of seeds and appropriate fertilisers give rise to high production for commercial purpose.

5. Plantation Agriculture:

Tea, Coffee, Coconut etc. come under plantation agriculture. At Thuamul-Rampur of Kalahandi district the plantation of tea and coffee is seen.

6. Mixed Farming:

Cultivation along with rearing of animals is called Mixed Farming. Such type of farming has not developed in Odisha. In Western Countries large amount of foreign exchange is earned through the export of beef and mutton.

7. Dairy Farming:

Dairy farming is a class of agriculture for long-term production of milk, which is processed (either on the farm or at a dairy plant, either of which may be called a dairy) for eventual sale of a dairy product. This type of farming can be more viable in water scarcity areas.

8. Fruits and Vegetable Farming:

Such type of Cultivation in Odisha is seen near the urban areas.

Taking into consideration of rainfall and irrigation facility, agriculture of Odisha can be broadly divided into three categories as follows

A. HUMID Farming-If the rainfall is more than 750 mm, then the region comes under Humid Farming.

B. DRY Farming-If there is irrigation facility and the amount of rainfall is less than 750 mm, the region is known as Dry Farming region.

C. IRRIGATED Farming-If there is irrigation facility both Rabi and Kharif crops are cultivated.

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Reasons for Agricultural Low Productivity in Odisha or Problems relating to Agriculture:

1. Depleting soil conditions.
2. Great pressure of population.
3. Low amount of land per cultivation.
4. Shrinkage of agricultural area.
5. Uneconomic land holdings.
6. Lack of crop rotation measures.
7. Unpredictable nature of monsoon.
8. Lack of irrigation.
9. Inadequate Banking and financing facility.

Types of Crops

Rice

Rice (Oryza Sativa) is a tropical monsoon crop, which means that its cultivation requires high temperatures to germinate, bloom and mature (10° to 21°C during sowing period and 35°C to 37°C at the time of harvest) and sufficient rainfall. As such, monsoonal lands are best suited to rice production.

A large supply of cheap labour is essential in preparing seed-beds; in broadcasting seeds or in transplantation of plants from nurseries to fields, in winnowing and harvesting, operations. Rice is sown in India in three ways - by broadcast, by drill and by transplantation from a seed-bed. In Odisha both broadcast and transplantation method of cultivation is generally followed. More labour is required because seed-beds are to be highly manured before the seeds are sown. After 4 weeks the seedlings are uprooted, tied in bundles and carried to the field for plantation.

Rice is the single most important food crop in India that occupies 44.0 million hectares of agricultural land which is the largest rice area in the world. Rice is grown in three seasons. Autumn and winter (or Kharif) season from June to October and summer (or Rabi) from December to May. The Kharif season accounts for 88% and Rabi season accounts for 12% of the total production of rice.

The “Integrated Cereal Development Programme- Rice” is being implemented since 1994-95, with the objective of augmenting paddy production and productivity as it is the single major cereal crop of the State. A major factor to boost agricultural production is to increase the coverage under HYV paddy. There has been a significant expansion of area under HYV paddy in Odisha despite inadequate irrigation facilities, shortage of inputs like HYV seeds, fertilizers and pesticides etc.

Pulses

The productivity of the pulses in the State is lower than the national average. Non-availability of suitable HYV seeds is the main constraint for productivity. Therefore to meet the minimum requirement of the state, it has been proposed to increase the area under pulses and to raise productivity by adopting dry land farming technique mixed and intercropping system and use of quality seeds and fertilizers. National Pulse Development Programme is being implemented in the State since 1994-95 with the objective of increasing production and productivity of pulses in the State Assistance is being provided for breeder seeds, foundation seeds and Block demonstration.

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The major oil seeds grown in the state are groundnut, sesame, mustard and Sunflower cultivation has also been introduced in western Odisha. For improving oil seeds production in the State, emphasis is being laid on production of certified seeds, supply of input kits, subsidised sale of quality seeds, plant protection chemicals and equipments and farm implements under the Centrally Sponsored Plan Scheme "Oil Seeds Production Programme" (OPP).

Commercial Crops

India ranks first in sugarcane (Saccharum Officinarum) production but in actual production of sugar it is much behind Hawaii, Java, Cuba and Brazil.

- Sugarcane grows best in area with 20°C to 26°C temperature.
- Frost is detrimental to cane. Short cool dry winter season during ripening and harvesting is ideal.
- About 150 cm rainfall and deep rich loamy soils are ideal for it, which are neither too acidic nor too alkaline.
- It is even grown on black soil.

Jute is the best fiber in India, obtained from the inner bark of two important species, Corchorus Capsularis (Or. white Jute) and Corchorus Olitorius (toss jute) which grow to the height of 2 to 4 metres. It is demanded for the manufacture of gunny bags, carpets, ropes, rugs and tarpaulin etc.

- A hot and damp climate is the best for it.
- More than 150 cm rainfall and average 80 to 90 per cent humidity is essential with a minimum temperature of 26°C.
- It is grown on soil which is enriched by new alluvium brought by river inundation.
- Jute grows to perfection on loamy soils, as water sinks quickly into it. The clayey soils give the heaviest yield and sandy soil produce coarse fibre.

India has a largest area under cotton cultivation in the world and produces 8.4 percentage of world's production.

- Cotton is a tropical crop and minimum temperature should not fall below 18°C.
- Rainfall should be moderate ranging between 50 cm to 75cm.
- It should not be over 85 cm for them the crop is destroyed.
- Cotton is a Kharif crop of India and is closely associated with Regur or Black Cotton Soil. Cheap labour is needed for sowing as well as picking.

Cotton is a major commercial crop predominantly grown in the KBK districts in Kharif season. Area coverage under cotton is growing in Bolangir, Kalahandi and Rayagada districts.

The development of commercial crops like - sugarcane, jute, pesta, cotton, soyabean, groundnut, potato, chilly and onion is being given more thrust to improve the rural economy.

Grown in Odisha

Food Grains

Food grains include cereals, millets and pulses. Among cereals the most important crop is rice. It is followed by ragi, maize, wheat, small millets and bajra. All these, except wheat are coarse cereals

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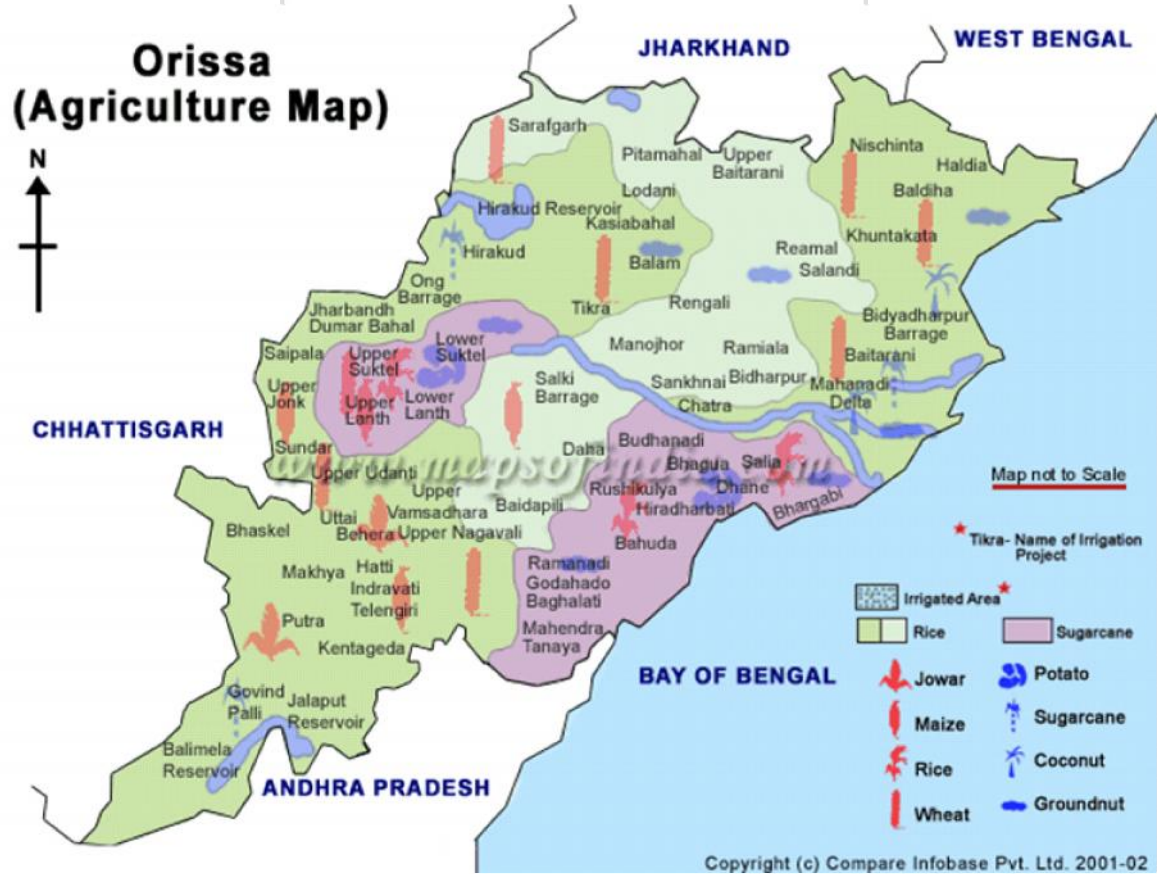
and belong to hardier crops which are mostly cultivated in the middle mountainous, rolling uplands and plateaus of Odisha.

Odisha is one of the largest producers of rice in India. The state grows almost one tenth of the total rice production of the country. Favourable climate and presence of rich soils accounts for the flourishing agriculture of Odisha. It is concentrated in the areas of Cuttack Sambalpur, Puri, Ganjam, Balasore, Koraput, Keonjhar and Kalahandi. Rice cultivation is mostly confined to the alluvial coastal plains and river valleys below the 305 meter contour line because of ideal topographical and soil conditions.

The main crops cultivated in the state are:

Rice, Jute, Oil seeds, Pulses, Coconut, Mesta, Sugarcane, tea, Rubber, Cotton, Gram, Mustard, Maize, Sesame, Ragi, Potato, Soybean . Apart from irrigation, floods, droughts, low yield per hectare and division and fragmentation of holidays are the most important agriculture problem of the state.

Crops in Odisha



Pulses

The most important pulses grown in Odisha are gram, tuar, arhar. According to the classification the pulses of Odisha can be broadly divided in to Kharif and Rabi crops. The Mahanadi delta, the Rushikulya plains regions are favourable to the cultivation of pulses. Production of pulses is basically concentrated in districts like Cuttack, Puri, Kalahandi, Dhenkanal, Bolangir and Sambalpur.

Oil Seeds

Sesame, groundnut, mustard, castor and linseed are the principal oilseeds grown in Odisha. Oilseeds are categorized as Kharif and Rabi crops. Rabi oilseeds grown as a second crop after the cereals are harvested. Among the oilseeds, groundnut and castor are the hardier crops and are grown in marginal and sub marginal lands.

Oilseed cultivation is concentrated in districts like Cuttack, Koraput, Kalahandi, Bolangir, Sambalpur, Dhenkanal and Ganjam. All these are located in a less hospitable terrain. Coconut is highly cultivated in Odisha especially in the coastal districts. In the coastal district of Odisha like Cuttack, Puri, Jagatsinghpur, Jajpur, Kendrapada, Khurda, Nayagarh, Ganjam a large number of coconut trees are seen.

Cash Crops

Among cash crops, fibre crops are especially important.

Jute accounts for the maximum areas. Odisha is the fourth largest producer of jute after west Bengal, Bihar and Assam. Rice and jute, compete with each other as they require almost similar soil and climatic conditions. Cultivation of jute is primarily confined to the coastal plains of Cuttack, Balasore and Puri districts.

A considerable amount of Roselle is also cultivated in Odisha. It dominates in the districts of Cuttack, Ganjam,Bolangir and Koraput districts.

Sugarcane is the second most important cash crop in Odisha in area as well as production. It is grown in irrigated areas. Odisha stands eight in sugarcane production in India. A considerable amount of sugarcane is cultivated in Cuttack, Sambalpur, Bolangir, Kalahandi and Puri districts. Odisha also produces a small quantity of tobacco. In cash crop production, Cuttack district tops the list.

New Cash Crops

Rubber Plantations

Rubber grows in the northern Odisha Mayurbhanj, Keonjhar and Balasore due to favourable agro climatic conditions. Odisha is a non traditional area for rubber plantations. Inland hill areas of Cuttack, Puri, Ganjam and Dhenkanal districts have agro climatic conditions suitable for rubber cultivation.

Cotton

Cotton cultivation has been taken up extensively in Koraput, Bolangir and Kalahandi districts where suitable soil and climate conditions are found.

Tea

It is concentrated in the areas of Eastern Ghats, Keonjhar mountainous region of Phulbani and Koraput.

Coffee

It is concentrated in forest lands of Eastern Ghats, Koraput, Kalahandi, Malkangiri, Rayagada, G. Udayagiri and Balliguda areas of Kandhamal district.

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Cropping Pattern

Agro-climate conditions exercise big influence of the type of crop to be grown in an area. More than 75% of the cultivated area in the State is covered under paddy crop.

Cropping Intensity

Cropping intensity is one of the indicator of the level of agricultural development. The cropping intensity of the State is gradually increasing. Due to development of irrigation facilities more areas were brought under cultivation and farmer could raise more than one crop in same land in the same year.

Horticulture

Odisha is blessed with varied agro climatic conditions suitable for growing fruits, vegetables and spice crops. Hill tracts of KBK districts and of Kandhamal and Gajapati districts are suitable for intensive horticultural activities.

The development of horticulture has importance not only for increasing the production of fruits and vegetables but also for improving the rural economy of the state by generating employment and income particularly for small and marginal farmers.

Cultivation of commercial fruits, use of hybrid vegetable seeds, propagation of off-season vegetable cultivation, establishment of bio centres for production of quality planting materials, use of quality potato seeds, installation of drip irrigation systems, beneficiary oriented cultivation of oil palm etc. are the major thrust areas in horticulture.

'National Horticulture Mission' (NHM), a central plan scheme is operating in 19 districts of the state since 2005-06 with 100% central grant. The crops selected under the mission are mango, banana, litchi, citrus under fruits category, cashew under plantation crops category, spices like ginger and turmeric, betel vine and floriculture.

Floriculture

There is an increasing demand for flowers like rose, marigold, gladioli, tube-rose etc. in the State and most of the flowers are being imported from the neighbouring state like West Bengal, Andhra Pradesh. Therefore emphasis is being given to encourage farmers of the State to increase their farm income as well as to create employment opportunity through floriculture. Financial assistance up to 50% of the cost of cultivation for small and marginal farmers and 33% for other farmers ranging from Rs. 7920/- per hectare to Rs. 45,000/- per hectare is being provided for commercial cultivation of flowers.

Spices

Ginger and Turmeric are the major spices grown in the State. Although, Odisha has a major share in production of ginger and turmeric, the varieties cultivated are mostly traditional and low yielding. Emphasis is being given for introduction of improved varieties.

Initiatives to revamp Agricultural System

1. Land Reforms :

   The main objective of land reforms is to establish a new agrarian structure based on social justice by reducing inequalities in possession of lands. Land reform measures initiated in the

state envisages abolition of intermediary rights, tenancy reforms like regulation of rent, provision of security of tenure to tenants, distribution of ceiling surplus land to the landless agricultural labourers and small land holders, consolidation of land holdings, and updating and maintenance of land records.

Most of the farmers in the State possess marginal or no cultivable land due to fragmentation of holdings. Consolidation of holdings includes preparation, correction, and updating of land records and amalgamation of small and scattered holdings in a rational manner with a view to ensure better land management and optimum utilisation of limited water resources.

2. Crop Insurance :

The comprehensive Crop Insurance Scheme was introduced in the State in 1985 with an objective to provide financial support to farmers on the event of crop failure and to restore credit eligibility of farmers after crop failure for subsequent cropping season.

The scheme was modified and made more liberal by Govt. of India and renamed as National Agricultural Insurance Scheme (NAIS) which is being implemented since 1999-2000, Rabi season. All farmers irrespective of their size of the holding, are covered under the scheme which covers risk in respect of loss of yield to crop due to natural calamities like flood, cyclone, storm, hailstorm etc. and other non preventive risks like natural fires, and lightening. Crops like paddy, groundnut, maize, ginger, red gram, mustard etc. The State Government and Government of India share the premium (as subsidy) on 50:50 basis.

Pradhan Mantri Fasal Bima Yojana

Agriculture in India is highly susceptible to risks like droughts and floods. It is necessary to protect the farmers from natural calamities and ensure their credit eligibility for the next season. For this purpose, the Government of India introduced many agricultural schemes throughout the country. The Pradhan Mantri Fasal Bima Yojana (Prime Minister's Crop Insurance Scheme) was launched by Prime Minister of India Narendra Modi on 18 February 2016 and also launced in Odisha. It envisages a uniform premium of only 2 per cent to be paid by farmers for Kharif crops, and 1.5 per cent for Rabi crops. The premium for annual commercial and horticultural crops will be 5 percent.

This scheme is dedicated to bring in more than 50% of the farmers under its wing within the next 2–3 years. Around 25% of the claims will be sent to the farmer's direct account. This insurance scheme, unlike the previous ones, covers local calamities too, such as landslide, hailstorm, inundation, etc. inundation was not covered by the previous schemes.

The government has proposed that there will only be one insurance company for the entire state. Mostly the private as well as the national agricultural insurance companies will be approached to implement it. The farmers of Odisha have been covered in this scheme.

3. Dry Land Farming :

Dry land farming is practiced under rain-fed condition over more than 60% of the cropped area of the State but with a much lower yield rate. The programme of cultivation under rain fed condition aims at minimising dependence on monsoon through conservation of water in small projects and maximising production through diversification of crops, mainly from dry land paddy to pulses and oilseed crops.

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The intensive approach of this programme envisages development of watersheds for proper management of rain water while the extensive approach aims at diversification of crops. Hence, for stabilising production in rain fed areas, more particularly in the KBK, Gajapati and Kandhamal districts, farmers need to be motivated to divert uplands for growing drought resistant crops. Inter-cropping is a very appropriate practice in dry land agriculture since it offers a kind of insurance against total crop failure in drought years.

4. Use of Fertiliser :

Optimum use of fertilizer in opportune time is an appropriate strategy for increasing agricultural productivity. It also protects land fertility by meeting the nutrition requirement of crops.

5. Pest Control :

Timely use of pesticides is essential to prevent crop damage. As high yielding varieties of crops are susceptible to pests and diseases, plant protection measures are equally important like use of fertiliser. However, excessive use of pesticides may be hazardous to human health. The technology inter-alia envisages encouraging the use of biological pest control measures, identifying the most poisonous/toxic pesticides and putting a ban in their use.

6. Agricultural Credit :

Agricultural credit is an essential input for augmenting agricultural production and helping the poverty stricken farmers of Odisha in meeting their investment requirement.

7. Soil Conservation and Watershed Development :

Watershed Development Programmes focus on harnessing and conserving land and water through various soil and water conservation interventions coupled with crop substitution and mixed cropping practices for increasing and sustaining the productivity of land and improving livelihood of the community. Soil Conservation activities are being taken up on watershed basis.

Integrated Wasteland Development Project aided by the World Bank, IndoDanish Comprehensive Watershed Development Project, National Watershed Development Project in rain fed areas and River Valley Programme under Central Sector are the important soil and water conservation programmes which are being implemented in the State. The primary objectives of these programmes are to prevent land degradation, promote and balance the ecosystem, enhance soil capacity to retain moisture, and increase the fertility and productivity of the soil. People's participation has been built into the programmes at all stages, from planning to execution.

Watershed Development Programmes are currently being implemented in the State under various Centrally Sponsored Schemes like Drought Prone Area Programme (DPAP), Integrated Watershed Development Programme (IWDP), National Watershed Development Programme for Rain fed Area (NWDPRA), River Valley Project (RVP), etc. The Watershed Development Programmes are also implemented with Additional Central Assistance received under RLTAP for KBK districts. One externally aided project funded by DFID namely Western Odisha Rural Livelihood Project (WORLP) is also currently being implemented in Baragarh, Kalahandi, Bolangir and Nuapada districts. The broad objective of the mission are as follows

(i) Identification and prioritization of Blocks and GPs on the basis of some identified objective criteria such as moisture index, area under assured irrigation, topographical features and

availability of waste land where comprehensive treatment is needed for improving soil and moisture regime.

(ii) Identification of particular watersheds.

(iii) Preparation of integrated watershed development programmes through active community participation.

(iv) Development of waste lands through appropriate interventions.

(v) Conservation of run-off water, recharging of aquifers, harvesting of rain-water and formulation and implementation of other related programmes.

(vi) Promotion of self-help groups of landless persons.

The soil and water conservation activities include construction of water harvesting structures, check dams, nalla bonding, contour trench, village tanks, storage tanks, gully plugging etc. Besides, appropriate plantation in the degraded lands and vegetative treatment in the catchments and also taken up under this programme.

The Odisha Watershed Development Mission (OWDM) was set up as a State level Umbrella Institution for monitoring co-ordinating and strengthening the watershed programme in the State. The watershed programmes were implemented through various Government agencies that acted as PIAs (Project Implementing Agency).

Agricultural Promotion and Investment Corporation Ltd. (APICOL):

The Agricultural Promotion and Investment Corporation of Odisha Limited (APICOL), since its inception in 1996 as a promotional organization, is engaged in promotion of commercial agricultural enterprises including agro-based food and non-food processing industries in the State. The corporation has been implementing various programmes through the agricultural extension network of the Department to encourage investment in the field of agriculture. It also acts as the channelizing agency for release of subsidy under farm mechanisation component of the Work Plan for Macro Management of Agriculture.

Odisha Agro Industries Corporation (OAIC):

OAIC is engaged in marketing various agricultural inputs including agricultural machineries/ equipments through wide network of district. Besides, the corporation executes tube wells, bore wells, direct irrigation projects for individuals as well as communities. It also provides other facilities such as fertilizers, pesticides, cattle and poultry feed to the farmers.

Central Rice Research Institute (CRRI):

The Central Rice Research Institute (CRRI) was established in Odisha in 1946 against the backdrop of the great Bengal Famine of 1943. This institute not only played a key role in ushering the country in an era of Green Revolution leading to self-sufficiency in food supply in about 25 years from its inception, but also brought glory to the nation by providing research support to become the second largest exported of rice in the world. The goal of the institute is to improve the income and quality of life of rice farmers. The main objective of the institution is to conduct basic, applied and adaptive research on crop improvement and resource management for increasing and stabilizing rice productivity in different rice ecosystems with special emphasis on rain fed ecosystem and the related a biotic stresses.

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Chapter - 10

IRRIGATION

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IRRIGATION

Irrigation plays a significant role in poverty reduction and economic growth. State Government is giving high priority to Irrigation Development. The state has a cultivated land of 61.80 lakh hectares. Till 2015-16 out of the total cultivable land 54.74 lakh hectares of land has been brought under irrigation coverage through major, medium and minor (flow & lift) irrigation projects.

Odisha is one of the states in the country, which is endowed with abundant water resources. But this resource is very unevenly distributed over time and space. The state has around 11% of the total water resources of the country with eleven river basins. Rainfall is the main source of water and long term average annual rainfall in the state is of the order of 1452 mm. which is equivalent to 230.76 billion cubic metres (BCM). About 78% of the above is received in the monsoon season (June to September). Due to rapid growth of population; the per capita availability of water is reducing year by year. As per the assessment made in 2015-16, the average per capita availability of water (both surface and ground) in the state was around 3359 cum, as compared to national average of 1820 cum, per annum.

It is said 'water is life'. Water has always played an important role in providing livelihood, hygiene and environmental securities. The demand pattern is changing rapidly due to increase of population with more demand of food production, spreading of urbanization with sanitation and rapid industrialization.

Irrigation Development

Agriculture is an integral part of the development system and irrigation holds the key to increase agricultural productivity. The first proposal to utilize the river water of Odisha for irrigation was made in the year 1858. But after introduction of Five Year Plan by Govt. of India in 1951, attempts were made for rapid harnessing of water resources and emphasis was laid to accelerate the creation of irrigation potential. Till 2016-17 net irrigation potential of 5474 thousand hectares (Th. Ha.) has been created through major, medium and minor irrigation projects by using surface and ground water resources. In addition about 621.55 Th. Ha. of irrigation potential have been created through unconventional sources like dug wells, water harvesting structure, small check dam etc.

The state government has given top priority for providing irrigation facilities at least 35% of the cultivable area. It has been assessed that out of major areas of the state have already been provided with 35% irrigation facilities.

Irrigation Potential Utilization

The irrigation potential created and utilised is not the same. The gap between potential created and utilised is attributed to many factors, but the main reasons are defunct LIPs, MIPs, deterioration of distribution systems of irrigation projects. Initiatives have been taken to minimize the gap between

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potential created and utilised. Canal system improvement works in some of the major and medium irrigation projects were completed through World Bank funded OWRCP and Government of India funded AIBP scheme. At present RIDF scheme funded by NABARD, Odisha Community Tank Management Project (OCTMP) funded by World Bank and RR&R funded by Government of India are being implemented for rehabilitation / modernisation of derelict / partly derelict MIPs. Besides, canal system improvement work of 11 major and medium irrigation projects and 1400 lift Irrigation projects are also being implemented under ADB-funded Odisha Integrated Irrigated Agriculture and Water Management and Investment Projects (OIIAWMIP). In-addition to above, CAD & WM works have been scaled up in different major and medium irrigation projects.

State Water Policy

The State has formulated its 'State Water Policy' in 1994 following principle enunciated in the National Policy, 1987. In the meantime the National Water Policy, 1987 has been revised, updated and a new policy titled National Water Policy, 2002 has been adopted by Government of India. Accordingly, the State Government has prepared a new water policy titled "Odisha State Water Policy – 2015" which has been approved by State Water Resources Broad recently.

Major & Medium Irrigation

Major and medium irrigation occupy a key position in the irrigation map of Odisha. It has been assessed that among all sources of irrigation, only major and medium irrigation can provide irrigation to 31.30 lakh hectares. But, the till end of 2015-16, total 20.41 lakh hectares of irrigation potential has been created. Besides, another 32 projects were in different stages of progress and on completion of these, another 10 lakh hectares of irrigation potential will be created.

Bharat Nirman Programme

It is a time bound programme (2005-2009) launched for building rural infrastructure in the areas of irrigation, Road, Housing, water supply etc. The irrigation components of this programme aims at creation of irrigation potential of 100 lakh hectares including 3.923 lakh ha. In Odisha with project investment of Rs. 2649.29 crore. All ongoing projects executed under existing schemes such as AIBP, AIDF, SCA, RR&R are clubbed up under this programme.

Minor Irrigation (Flow)

Minor Irrigation (Flow) scheme has its own importance due to low gestation, less investment and quick benefit. The minor irrigation projects have contributed substantially to augment the irrigation potential in the State. It has been assessed that 7.1 lakh hectares of irrigation potential has been created through M.I. (flow) projects & through Minor Irrigation (Lift) 13.44 lakh hectares of irrigation potential has been created till 2015-16.

Lift Irrigation

Odisha Lift Irrigation Corporation was setup in the year 1973 to exploit the surface and ground water resources on a mega scale by pooling funds from all sources. After implementation of PaniPanchayat Act, 2002, OLIC is no more collecting water charges from the cultivators of the PaniPanchayats.

Soil Conservation

Watershed Development Programme (WDP) focuses on harnessing and conserving land and water through various soil and water conservation interventions for increasing and sustaining productivity of land and improving livelihood of the community. These programmes are being implemented in the State under various Centrally Sponsored Schemes like

- Drought Prone Area Programme (DPAP),
- Integrated Waste Land Development Programme (IWDP),
- River Valley Project (RVP) etc.

Besides, IWDP are also being implemented under Western Odisha Rural Livelihood Project (WORLP) for Baragarh, Bolangir, Nuapada and Kalahandi districts. The Odisha Watershed Development Mission (OWDM) has been setup for coordination, monitoring and strengthening the implementation mechanism of all Water- shed programmes in the State.

Irrigation Schemes

A number of schemes / programmes are being implemented in the State for development of Irrigation. They are as follows

- Pradhan Mantri Krishi Sinchai Yojana
- Jalanidhi Programme
- Accelerated Irrigation Benefit Programme (AIBP)
- Rural Infrastructure Development Fund (RIDF)
- Japan International Co-operation Agency (JICA)
- Biju Krushak Vikash Yojana
- Odisha Integrated Irrigated Agriculture and Water Management Investment Programme (OIIAWMIP)
- Odisha Community Tank Management Project (OCTMP)
- Dam Rehabilitation and Improvement Project (DRIP)
- Deep Bore-well irrigation programme.
- Repair, Renovation, Restoration of water bodies. (RR&R)
- Mega lift Construction Programme.
- Pani Panchayat

Pradhan Mantri Krishi Sinchai Yojana

Pradhan Mantri Krishi Sinchai Yojana (PMKSY is a national mission to improve farm productivity and ensure better utilization of the resources in the country. The budget of 500 billion (US$7.4 billion) in a time span of five years has been allocated to this scheme.

The primary objectives of PMKSY are to attract investments in irrigation system at field level, develop and expand cultivable land in the country, enhance ranch water use in order to minimize wastage of water, enhance crop per drop by implementing water-saving technologies and precision irrigation. The plan additionally calls for bringing ministries, offices, organizations, research and

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financial institutions occupied with creation and recycling of water under one platform so that an exhaustive and holistic outlook of the whole water cycle is considered. The goal is to open the doors for optimal water budgeting in all sectors. Tagline for PMKSY is “more crop per drop”.

Jalanidhi Programme

The Jalanidhi Programme encourages farmers to go for creation of captive irrigation sources through shallow tube wells, bore wells, dug wells and river lift projects by way of administering back ended subsidy against creation of such assets. Tied with NABARD, the state Government provides subsidy under this programme.

Accelerated Irrigation Benefit Programme (AIBP)

Government of India launched the Accelerated Irrigation Benefits Programme (AIBP) during 1996-97 for providing loan assistance to State Governments for accelerating the pace of irrigation development in the country. The primary objectives of AIBP are

1. To accelerate implementation of ongoing irrigation projects.
2. To realize bulk benefits from irrigation projects.

To carry on reformation, the state of Odisha has been availing central assistance as per relaxed norms of AIBP. The projects in KBK districts are treated at par with Special Category States & the projects in Non-KBK districts are treated under relaxed norm. Altogether 18 Major and Medium Irrigation Projects & 22 Minor (flow) Projects have been approved under AIBP.

Rural Infrastructure Development Fund (RIDF)

Agriculture and Rural Infrastructure Sectors play an important role for growth of economy. There are many infrastructure projects, which have been started but are lying incomplete for want of resources. Even though there is an urgent need of creating adequate employment opportunities in rural areas through development of infrastructure there had been virtually no institution arrangements for financing rural infrastructure.

Against this background, Government of India in the Budget of 1995-96 announced the scheme for setting up Rural Infrastructure Development Fund (RIDF) to be operationalized by NABARD. This fund has emerged as a popular and effective scheme or financing rural infrastructure projects. The primary objective is to assist State Governments for the completion of ongoing rural infrastructure projects and also taking up new projects.

Externally Aided Projects

Japan Bank of International Co-operation (JBIC)

Japan is providing ODA (Overseas Development Assistance) loan to developing countries at low rates of interest and with long repayment periods to develop and improve the economic and social infrastructure for sustainable economic development. So far 3 Major projects namely Upper Indravati Irrigation Project, Upper Kolab Irrigation Project & Rengali Left Bank Canal have been sanctioned under this scheme.

Biju Krushak Vikash Yojana (BKVY)

This novel scheme was launched by State Government in 2001 with an object to revive derelict projects & construction of new projects particularly in minor irrigation sector through people’s

participation, assistance will be limited to 80% of estimated capital cost and contribution of Panchayat shall be 20% of the cost.

The PaniPanchayat contribute its share either in cash or in labour or in the form of land etc. The assistance to a PaniPanchayat towards the capital cost shall be given only after it is registered as Society under the Societies Registration Act, 1860 for which a model byelaw will be furnished by the DOWR.

At present the funding for execution of MIPs & LIPs in KBK districts are basically met from Special Central Assistance (SCA) received under RLTAP. Similarly, loan assistance from NABARD is being availed under RIDF scheme for execution of MIPs& LIPs in nonKBK Districts.

Other Important Activities

PaniPanchayats, Participatory Irrigation Management (PIM)

PIM concept has been introduced in the State during 1995, on pilot basis in four projects with the assistance of World Bank under the banner Farmers' organization & Turn over (FOT). To motivate farmers in irrigation management, massive awareness campaign, training programmes & workshops have been done at regular intervals.

Due to overwhelming response, during 2000, the programme was named "PaniPanchayat" and was extended to all commands of Major, Medium, Minor& Lift Irrigation Projects. To make Pani Panchayats successful, legal status has been provided by enacting the 'Odisha Pani Panchayat Act. 2002' & the 'Odisha Pani Panchayat Rule, 2003'.

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Chapter - 11

POWER

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POWER

Energy otherwise known as power is one of the prime movers of any developed economy. Adequate and reliable availability of power is indispensable for sustained growth of the economy. The primary objectives in this sector are optimum utilisation of the power generated, substantial reduction of transmission and distribution losses, maximising generation from the existing capacity and further addition of units to generate more power for meeting the increasing demand for power over the coming years. Besides, optimum utilisation of existing capacity and generation from new units will undoubtedly enable the State to sell power outside the State and thereby earn substantial revenue.

The Department of Energy was created on 24th April 1990 consequent upon bifurcation of the then Irrigation & Power Department. The objective of the Government is to provide 24x7 quality power supply to all. It is also contemplated to develop an integrated energy management system with robust generation, transmission and distribution network. The State of Odisha has the distinction of being the pioneer in the country in implementing reforms in power sector.

The present Demand (Estimated) in 2015-16 is 2934 MW, Availability of power from different sources

State Sector	: 1466 MW
Central Sector	: 1275 MW
Other Sources	: 85 MW
From Captive Plants	: 75 MW
Total	: 2901 MW

At present the Department of Energy is functioning with 5 Heads of Department i.e.:-

(1) E.IC (Elect)-cum-PCEI, Odisha, Bhubaneswar

(2) C.E-cum-CEI (Central Zone), Odisha,

(3) C.E-cum-CEI (South Zone), Odisha,

(4) C.E-cum-CEI (North Eastern Zone), Odisha,

(5) C.E-cum-CEI (Western Zone), Odisha,

The Department has got five Public Sector Undertakings Viz.

1. Odisha Hydro Power Corporation (OHPC),
2. Odisha Power Generation Corporation (OPGC),
3. Odisha Power Transmission Corporation (OPTCL),
4. GRIDCO Ltd. and
5. Odisha Thermal Power Corporation (OTPC).

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The state of Odisha has the distinction of being the first State in the country for ushering in sweeping reforms in the power sector. The paramount objective of the reforms in power sector is to provide consumers with reasonably cheap, reliable and assured supply of power. In order to achieve this, the Odisha Electricity Reforms Act, 1995 was enacted and came into effect on April 1996. With the enactment of Odisha Electricity Reforms Act, 1995, the erstwhile Odisha State Electricity Board (OSEB) was restructured and the function of OSEB were entrusted to two new Corporations namely

(i) GRID Corporation of Odisha (GRIDCO) and

(ii) Odisha Hydro Power Corporation (OHPC) on April, 1996.

The existing transmission and distribution system was transferred to GRIDCO and all hydro power stations including projects under construction were transferred to OHPC. The Odisha Power Generation Corporation (OPGC), which was incorporated in 1984, is looking after the thermal power projects in the State.

The objectives of restructuring process are:

1. To relieve Government from the burden of providing financial support to the power sector.
2. To encourage private sector participation and
3. To introduce efficiency and cost effectiveness in the sector.

In order to achieve the desired objective of the reforms, under the Odisha Electricity Reforms Act, the Odisha Electricity Regulatory Commission (OERC) was created. It has been entrusted with the responsibility of promoting efficiency and economy as well as protecting the interest of consumers

The distribution function of GRIDCO was privatised in the year 1999 and was entrusted to four private distribution companies namely CESCO(CESU), WESCO, NESCO and SOUTHCO. GRIDCO is now the sole transmission licensee for supply of power in Odisha. It purchases power from various sources like Odisha Hydro Power Corporation, OdishaPower Generation Corporation, National Thermal Power Corporation and Captive Power Plants in the State.

Odisha Power Generation Corporation (OPGC)

The Odisha Power Generation Corporation Ltd. (OPGC) was incorporated in November, 1984 under the Companies Act, 1956 with the main objective of establishing, operating and maintaining large thermal power generating stations independently or in the joint sector.

For outstanding achievement in environment management ITPS has been selected for Greentech Environmental Excellence Gold Award in Thermal Power Sector.

Odisha Hydro Power Corporation (OHPC)

The Odisha Hydro Power Corporation was registered under the Companies Act and was started functioning from April, 1996. In pursuance of the Odisha Electricity Reform Act, 1995, all hydel power projects of the state have been transferred to this corporation for operation and maintenance.

OHPC has also taken up the execution and completion of Upper Indravati Hydel Project and Potteru Small Hydro Electric Project. Besides, it has taken up renovation and modernization of old Hydel Power Station at Hirakud and Chipilima and expansion of Balimela Power Station by two more units of 75 MW each.

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Grid Corporation of Odisha (GRIDCO)

The reform process in power sector was first adopted in Odisha with effect from 1St April, 1996. After introduction of reform process, GRIDCO has been vested with the transmission and bulk supply business. As per license agreement by OERC, GRIDCO was further bifurcated into two companies viz.

(i) Grid Corporation of Odisha Ltd. And

(ii) Odisha Power Transmission Corporation Ltd. (OPTCL) with effect from 9th June, 2005.

GRIDCO was vested with trading and bulk supply license by OERC, OPTCL is the sole licensee for inter-State Power Transmission and wheeling of electricity. It also controls the State Load Despatch Centre activities for grid operation in the State.

GRIDCO purchases power from various sources like OHPC, OPGC, NTPC and CPPs in the State. It also receives State share from Central Sector Power Stations viz. Farakka, Kahalgoan, Kaniha etc. through EREB system.

OPTCL constructed major lines and substations to upgrade the existing system withan aim to provide quality and uninterrupted power supply by availing loan from World Bank. After closing of loan, OPTCL is completing the unfinished projects from its own resources.

Odisha Renewable Energy Development Agency (OREDA)

The Odisha Renewable Energy Development Agency (OREDA) was constituted as a State Nodal agency in the 1984 under aegis of Dept. of Science and Technology. Govt. of Odisha with the view to popularize the exploitation and use of renewable energy resources in the State.

The mandate of the agency covers the entire gamut of renewable energy resources such as Solar, Wind, Hydro, Biomass, Geothermal and Tidal Energy sources. Odisha from the point of view of its geographical location has been endowed with plenty of Renewable Energy Resources.

Accelerated Power Development & Reform Programme (APDRP)

Govt. of Odisha have signed a MOU with Govt. of India to implement the Accelerated Power Development & Reform Programme (APDRP) in the State. The objectives of the programme are improvements of financial viability through loss reduction, improved consumer service and reliable and quality supply of power.

ELECTRIFICATION SCHEMS BY GOVT. OF INDIA

1. RAJEEV GANDHI GRAMEEN VIDYUTIKARAN YOJANA (RGGVY)

This flagship programme of Govt. of India launched in April, 2005 to provide access to electricity to villages having population of 100 or more envisaging 90% capital subsidy and 10% as loan component for the State, has been subsumed under Deendayal Upadhyaya Gram Jyoti Yojana.

Under Rajeev Gandhi Grameen Vidyutikaran Yojana, every village is to be provided with electricity by 2009 and each house- hold by 2012. The main objective of the scheme is:-

1. Providing access to electricity to all households in the state in the next five years.
2. Electricity to all villages and habitations.
3. To provide electricity connection to each BPL families free of charge through creation of Rural Electricity Distribution Backbone with at least one 33/11 KV (or 66 KV) substation in each block, village electrification infrastructure with at least one distribution transformer in each village/habitations.

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2. DEENDAYAL UPADHYAYA GRAM JYOTI YOJANA (DDUGJY)

Deendayal Upadhyaya Gram Jyoti Yojana is a Govt. of India scheme which aims at strengthening the Sub-Transmission and Distribution Infrastructure in the rural areas with separation of agriculture and non-agricultural feeders to regulate power supply to the agricultural consumers as and when needed for effective Demand Side Management (DSM) and proper energy accounting by means of metering arrangement at Distribution Transformers, Feeders and Consumer end.

The scheme subsumes the RGGVY as a rural electrification component and the Outlay under the RGGVY is carried forward to the DDUGJY with its (DDUGJY) original Outlay made by Govt. of India.

3. INTEGRATED POWER DEVELOPMENT SCHEME (IPDS)

Integrated Power Development Scheme is a Ministry of Power, Govt. of India scheme introduced in 2015-16 in order to create a strong infrastructure for strengthening the Sub-Transmission and Distribution Network with IT enabled Smart Metering of Distribution Transformers, Feeders and Consumers vis-a-vis reduction of losses in the urban and semi-urban areas by means of supplementing financial assistance to the DISCOMs.

4. Ujwal DISCOM Assurance Yojana (UDAY)

Ujwal DISCOM Assurance Yojana (UDAY) is the financial turnaround and revival package for electricity distribution companies of India (DISCOMs) initiated by the Government of India with the intent to find a permanent solution to the financial mess that the power distribution is in. It allows state governments, which own the discoms, to take over 75 percent of their debt as of September 30, 2015, and pay back lenders by selling bonds. Discoms are expected to issue bonds for the remaining 25 percent of their debt.

Till now 29 states /UT have joined this scheme with Sikkim becomes the 22nd state to launch. The scheme is optional for the states to join. Andhra Pradesh was the first state to join. Other states that have given their in-principle approval are: Gujarat, Chhattisgarh, Andhra Pradesh, Rajasthan, Punjab, Haryana, Jammu & Kashmir, Himachal Pradesh, Madhya Pradesh, Uttarakhand, Telangana.

Recently Uttar Pradesh, Bihar, Odisha, Maharashtra and Tamil Nadu, Mizoram joined, thereby making the total of 27 states to have joined the scheme.

ELECTRIFICATION SCHEMS BY GOVT. OF ODISHA

(a) Biju Gram Jyoti Yojana (BGJY):

In order to ensure “Electricity to all” the State Government has launched a flagship scheme called Biju Gram Jyoti in 2007-08 for electrification of habitations having less than 100 population and the BPL Household Electrification in those habitations which are not covered under RGGVY.

(b) Biju Saharanchala Vidyutikaran Yojana(BSVY)

For providing access to electricity to the people living in unelectrified areas of urban local bodies, the State Government has launched a flagship programme namely, Biju Saharanchala Vidyutikarana Yojana (BSVY) during the year 2010-11. Under the scheme un-electrified habitations with minimum population of less than hundred along with BPL household electrification and system improvement are being taken up.

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Chapter - 12

MINERAL RESOURCES OF ODISHA

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MINERAL RESOURCES OF ODISHA

Odisha, situated on the eastern seaboard of India is one of the gifted parts of the world, where a gamut of mineral resources exist in bounty. Odisha, a major state of India has enormous mineral potential and is rich in mineral resources. Many of the minerals are known to be in abundant supply, while many are least known in this state.

Odisha produces enormous minerals including non-metallic, metallic and fuel minerals. Odisha stood one of major producer of Chromite, Nickel, Iron, Manganese, Tin, Graphite, Bauxite, Lead and Zinc in India. Among the fuel minerals, coal of Ib-River and Talcher coalfields continues to play a dominant role among the domestic energy resources in this state. In terms of geographical distribution of mineral resources of India, about 10-14 % of mineral production comes from the state of Odisha.

The mineral resources of Odisha form a very important constituent of India's mineral wealth. Her possession includes a wide variety of ores and minerals such as Iron ore, Chromite, Manganese ore, Bauxite, Noncoking Coal, Limestone, Dolomite, Nickel ore, Copper ore, Lead ore, Fireclay, China clay, Graphite, Quartz and Quartzite, mineral sands like Limonite, Sillimanite, Zircon and Tin ore.

Recent discovery of diamond in the Dharambandha area of Nuapada district by the State Directorate of Geology has added a coloured feather in the cap of the state. Other minerals of the state include copper ore, lead ore, titanium bearing vanadiferousmagnetite, talc/soap stone and high magnesia igneous rocks. Recent boom of the mineral industry has turned the state into a hotspot, with entrepreneurs from all over the world crowding for their share of fortune.

The rich mineral wealth of the state is attributed to its favourable geological set-up. Situated on the eastern fringe of the peninsular India, Odisha has about 72.5% of the area occupied by Precambrian metamorphic rocks (of Archaean and Proterozoic age) which host the majority of the minerals. The Gondwanas hosting the coal resources occur over about 8% of the land mass. The Tertiary and Quaternary formations, occupying rest of the area, provide avenues for aluminous/nickeliferrous laterite and heavy minerals (in beach sand).

The Archaean rocks in northern Odisha include the Supracrustal belts of metasedimentary rocks including Iron Ore Super Group having deposits of iron, manganese, gold and basemetals. These are also represented by the gneisses, granite, migmatite (Singhbhum, Bonai and Mayurbhanj Plutons) and mafic/ultramafic intrusives. These intrusives are associated with the chromite, titaniferrousvanadiferrous magnetite and PGM. The Bastar cratonic complex of Archaean age in the Western Odisha includes gneisses, granite, migmatite and Strontium-Tantalum-Niobium bearing pegmatites. Proterozoic rocks in the Western Odisha exhibit plat formal sedimentary formations

and associated limestone deposits. In north-western Odisha they contain metasediments of low to medium metamorphic grade classified as the Gangpur Group, which host manganese, limestone and Lead-Zinc deposits. Incentral and southern Odisha, the Proterozoics are represented by the Eastern Ghats granulite belt comprising of khondalite, charnockite, migmatite, anorthosite and alkaline rocks accounting for the mineralisation of bauxite, manganese, graphite and gemstones. The Mesozoic rocks of Gondwana Super Group host the major coal resources of the state.

Formations of Cenozoic age occupy the eastern coastal plains in form of alluvial sediments, ash bed sand low level laterite, providing avenues for occurrence of beach sand minerals and building materials.The deltaic fans extending into offshore regions play hosts for oil and gas.

Odisha has a lion's share of the Country's mineral reserves. The chromite, nickel, bauxite, iron ore and coal resources of the state respectively stand at a staggering 83, 92, 55, 38 and 26 percent of India's total reserves. Some of these minerals also account for a visible spot in the world's mineral map.

Several mineral based industries have already come up in the State. The major ones include Rourkela Steel Plant, Tata Steel Plant at Kalinganagar, Vedanata Plant in Lanjigarh, Alumina Refinery and Smelter of Nalco at Damanjodi and Angul, Charge Chrome plants at Baminipal, Bhadrak, Choudwar and Theruvali by OMC, FACOR, ICCL and IMFA respectively, Minerals and separation unit at Chatrapur by IRE. Many cement and sponge iron plants have been set up.

Coal based thermal power plants have been set up at Talcher, Kanihan and Banaharpali. Captive thermal power plants have also been set up by NALCO, RSP, ICCL, INDAL etc. and many more are in the pipeline.

The dynamic State Government of Odisha has left no stone unturned in cashing the attention. It has been getting from different business houses in recent times. The visionary Chief Minister with his view on the future development of the state has signed 79 MoUs with various Companies to set up mineral-based industries with a total proposed investment of Rs.3,65,327.20crores, which is supposed to provide value addition to the mineral wealth there by augmenting employment and enhancing the economic standard of the public.

The huge mineral resources of the state, 480 km long coastal stretch, the liberalised economic policy of Govt. of India, Industrial Policy 2015 and availability of infrastructural support makes the state an investors' paradise.

MAJOR MINERALS OF ODISHA & THEIR DISTRIBUTION

1. Bauxite

Bauxite is a heterogeneous ore of aluminium. It is derived from Khondalite and Charnockite consists of Gibbsite, Goethite and Kaolinite in varying proportion with some Garnet, Hematite, and Limonite as accessory minerals. Although Bauxite is the main source of aluminium, it is the second abundant metal element in the earth's crust after silicon. Bauxite is mined for production of alumina by the Bayer's process.

Occurrence

The main Bauxite deposits of Odisha are associated with the Eastern Ghats Super Group of rocks and form the major component of the East Coast Bauxite (ECB) deposits.

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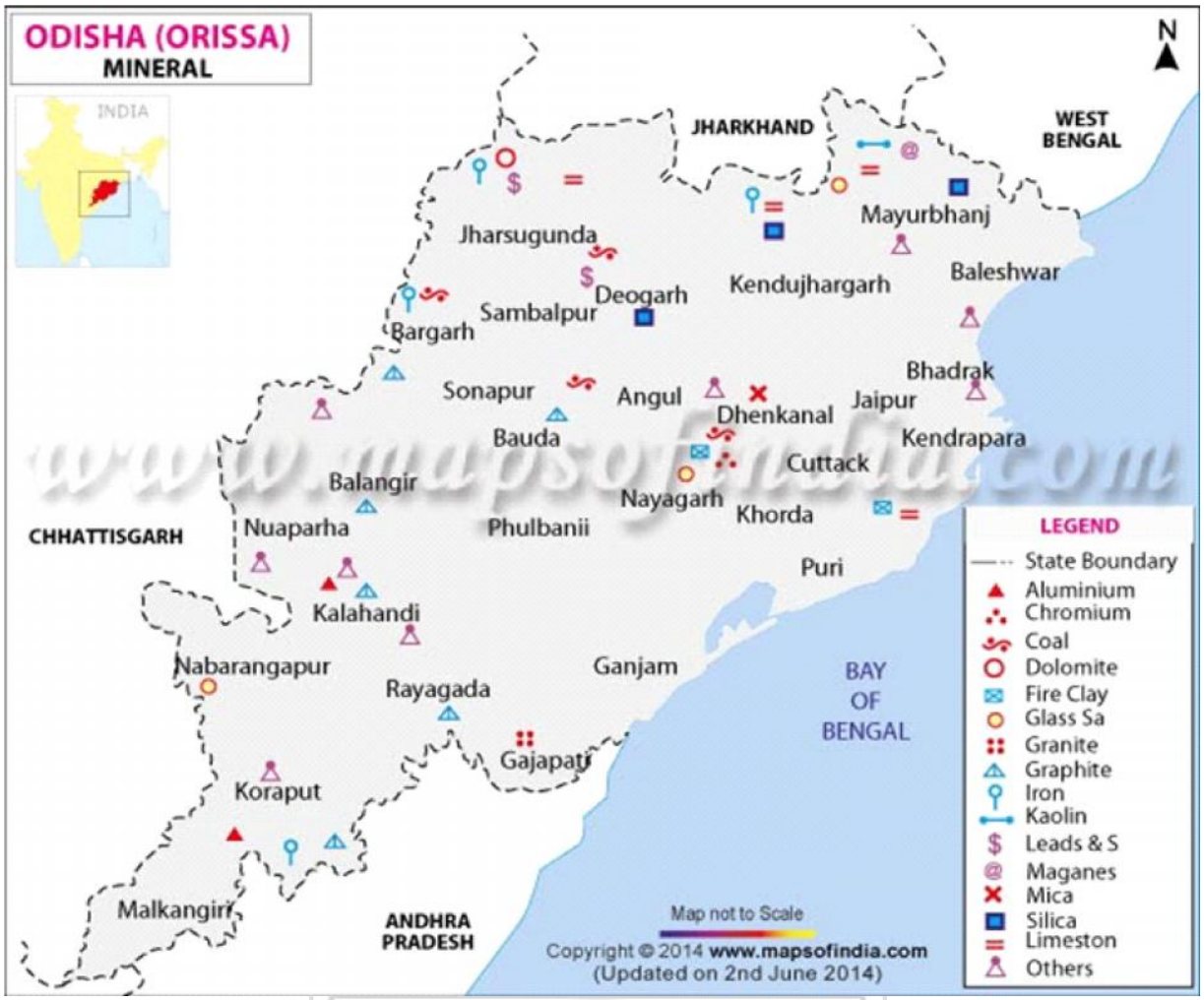
MINERAL MAP OF ODISHA



All the East Coast Bauxite capping over Khondalite in Odisha sector e.g., Ballada, Maliparbat, Panchpatmali, Kodingamali, Karnapadikonda, Bapulimali, Sijimali, Lanjigarh etc. of Koraput and Kalahandi districts occur in a single planation surface (+900m above MSL).

Bauxite caps the Gandharmardan plateau over Khondalite on the Border of Bolangir-Sambalpur districts. It occurs in the Kandhamal hills overlying the Vindhyan shale. Small and isolated bauxite capping occur over BIF (shale) formation at elevations of 610-671m above MSL around Kusumdihi in Sundargarh District. Bauxite with intercalated laterite caps over metavolcanics on the flat-topped hill namely DholkataPahar and Kanjipani range of Keonjhar District.

2. COAL

Out of 57 Gondwana and 14 tertiary coalfields considered for the national inventory of coal, Odisha state has only two. They are Ib-River coalfield and Talcher Coalfield. Yet its share in the reserve so far established in the country amounts to 23.6%.

Occurrence

The Ib-River Coalfield is named after a tributary of the Mahanadi. The coalfield is located in the south eastern part of Mahanadi Master Basin and occupies an area 1460 sq. km. The coalfield is bounded by latitudes $21^0$30' and $22^0$14'N and longitudes $83^0$32' and $84^0$10'E. It covers parts of Sundargarh, Jharsuguda and Sambalpur districts. It embraces the Hingir Sub- basin in the north and the Rampur Sub-basin in the south.

The Talcher Coalfield constitutes the south-eastern most member of the Lower Gondwana Mahanadi Master Basin. This basin mainly occupies the Brahmani River Valley. It covers parts of Dhenkanal and Angul districts along with a small portion of the adjoining Sambalpur District.

The major parts of the Talcher and Ib-River Coalfields are covered by the Talcher, Karharbari, Barakar, Barren Measures, Lower Kamthi (Raniganj) and Upper Kamthi sediments.

3. CHINA CLAY

China clay is also clay like material comprising mostly mineral Kaolinite. It has a specific gravity of 2.6 and a fusion point of1.785°C.Kaolin deposits have been formed by decomposition of feldspathic granite. Kaolin occurs in form of pockets or lenses within the main mass of granite.

Occurrence

China clay is found to occur in a long belt stretching from southern Singhbhum to Mayurbhanj Granite belt. Badampahar-Joshipur, Karanjia- Ramchandrapur belt with a number of deposits is the most important china clay producing area of the state.

Besides these, there are a few occurrences in Keonjhar, Sambalpur, Koraput, Sundargarh and Dhenkanal districts. The important deposits in Mayurbhanj District are found near Joshipur, Dumuria, Jamba, Kadodiha, Jamkeswar and Thakurmunda.

4. CHROMIUM

Chromium is indispensable for industrial complexes including aerospace, steel and specialalloys. Chromite is the only economic source of chromium. Chromite belongs to the spinel group. It has five major components viz., MgO, FeO, Cr_2O_3, Al_2O_3 and Fe_2O_3, whose proportions are greatly controlled by the composition of the magma from which the primary silicates and chrome spinelcrystallized.

Occurrence

Chromites are confined to three areas in Odisha.

(a) Boula-Nuasahi in Keonjhar district. The chromite deposits occur at and around Bidyadharpur barrage, Nuasahi and Agarpara.

(b) Sukinda in Jajpur district. The main deposits of Chromite and Nickel of Sukinda are present in the area Kamardah, Saruabil, Kaliapani, Kathpal, Maruabil, Bhimtangar etc.

(c) Bhalukasuni in Balasore district. The main deposits of this area are Bhalukasuni village of Nilgiri Sub-division.

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5. IRON ORE

Iron is a very important element comprising about 5% of the earth's crust. It is rarely found in native condition except in the meteorites and eruptive rocks in association with Cobalt and Nickel. The source minerals from which iron is being extracted on commercial scale are only a few, like Hematite, Magnetite, Goethite, Siderite.

Occurrence

The iron ore deposits of the state occur in five distinct zones.

(a) Bonai (Sundargarh District) Kendujhar (Keonjhar District) Belt

(b) Gandhamardhan of Keonjhar District.

(c) Tomka- Daitari of Jajpur District.

(d) Gorumahisani-Badampahar of Mayurbhanj District.

(e) Hirapur of Nawarangpur District

6. FIRECLAY

The term fireclay has been commonly applied to refractory clays, which can withstand of 1500°C or higher temperature. It is basically Kaolinite. On the basis of plasticity, fireclay is classified as plastic, semi plastic and non-plastic. An important parameter of fireclay is refractoriness expressed in terms of pyrometric cone equivalent (PCE).

Occurrence

In Odisha fireclay are confined to three geographical belts.

(a)Talcher Coalfield in Dhenkanal and Angul

(b) Ib-River Coalfield

(c) Athgarh Basin

7. GRAPHITE

Natural graphite is an allotrope of elemental carbon, which crystalises in the hexagonal system. It is a soft and opaque black mineral with a metallic lustre, greasy feel, hardness of 1to2 in Moh's scale, specific gravity of 2.09 to 2.93.

Occurrence

The major graphite zone of Odisha are

(a) Sargipali belt of Bargarh, Bolangir and Kalahandi districts.

(b)Titilagarh belt of Bolangir and Kalahandi districts.

(c) Tumudibandh belt of Phulbani, Rayagada and Gajapati districts.

(d) Dandatopa belt of Dhenkanal and Angul Districts.

8. MANGANESE ORE

It was recognised as an element in 1774 by Swedish chemist Scheele. The average crustal abundance of manganese is slightly less than 1% (950 PPM).Manganese deposits are widespread in the world's land areas. The common primary minerals of Manganese deposits of Odisha are pyrolusite, Rhodonite, Manganite, Jacobsite and Psilomelane.

Occurrence

Manganese ore deposits of Odisha occur in three distinct geological set-ups

(a) Bonai-Keonjhar - Bonai-Keonjhar belt constitutes the most important manganese ore producing region of the country.

(b) South Odisha - The manganese ore deposits of south Odisha comprising parts of Rayagada, Kalahandi and Bolangir districts are associated with Khondalite suit of rocks belonging to the Eastern Ghats Super Group.

(c) Ghoriajhor area of Sundargarh District -Manganese bearing gondite of Ghoriajhor formation is the youngest horizon occurring in the core of Gangpur synclinoriun.

INDUSTRIAL SCENARIO IN ODISHA

Major industries in Odisha at the moment include an integrated steel plants at Rourkela, Kalinga Nagar, Jharsuguda and Angul; NALCO (National Aluminium Company Ltd.) with its Alumina Plant at Damanjodi& Aluminium smelting complex at Angul; Thermal power plants Talcher & Ib valley area etc. in addition to Fertilizer plants, Pulp and paper industries, Ferro alloys plants, cement plants etc. elsewhere in the state. The industrial growth in the state has mostly taken place in the areas where raw materials, water and power are available. The state can be divided into twelve industrially active zones / areas based on minerals namely:

- Rajgangpur Area (Iron & Steel, Sponge Iron, Cement, Secondary steel. Melting and rolling mill & refractories and chemicals).
- Ib valley area (Thermal power, Sponge iron, refractories, and coal mines)
- Hirakud area (Aluminum & rolling mills)
- Talcher-Angul area (Thermal power, Aluminum, Coal washeries, Ferro alloys, Coal mines).
- Choudwar area (Ferro alloys, Thermal power, pulp and paper, coke oven)
- Balasore area (pulp and paper, ferro alloys, rubber industries)
- Chandikhol (stone crusher, coke oven)
- Duburi (Integrated steel, ferro alloys, rubber industries)
- Paradeep area (fertilizer, sea food processing, petroleum coke)
- Khurda Tapang area (stone crusher)
- Joda Barbil area (iron, sponge iron, ferro alloys, iron ore crusher, mineral processing).
- Rayagada area (pulp and paper, ferro alloys).
- NMIZ in Kalinganagar of jajpur district.

INDUSTRIAL POLICY IN ODISHA

Industrial Policy Resolution (IPR) 2015

The Industrial Policy Resolution 2015 has been formulated to create a conducive environment through an enabling Policy and regulatory framework to drive sustainable industrial growth in the State. The State is committed to simplify the processes and procedures and expedite project approvals and clearances.

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Priority sectors have been identified with additional incentives. Industries both existing and upcoming are expected to avail the benefits as per IPR 2015 and create employment opportunities, augment revenue in the State. The Policy focuses on providing quality industrial infrastructure, creation of a large land bank, financial assistance to the private sector for development of industrial infrastructure and sustainable environmental protection measures by the MSME Units. The emphasis of the policy is to make Odisha "a destination of choice" for industrial enterprises.

For faster industrial development in the State the IPR 2015 emphasizes on strengthening institutional & regulatory mechanisms. The three tier single window clearance system at State, Region & District level expects to maximize the triple objectives of value addition, employment generation and revenue augmentation through industrialization.

Establishment of National investment & manufacturing Zones (NIMZ) at Kalinganagar, Dhamra & Gopalpur; Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) in Jagatsinghpur & Kendrapada districts and a SPV Paradeep investment development region limited shall add to the State industrial cluster remarkably.

MSME Development Policy-2015

Odisha MSME Development Policy-2015 aims to attract new investments and provide support to the existing enterprises and the frame work has been divided as Enabling, Supporting and Incentive frame work. The new IPR-2015 targets some of the fiscal incentives towards MSME's such as, providing land at concessional rates, interest subsidy, exemption of stamp duty, VAT reimbursement, assistance for technical knowhow and marketing supports and many more. The main emphasis of this new MSME policy is to make Odisha "a destination of choice" for MSME enterprises.

The main objectives of this new policy are:

i. Enhance competitiveness of MSME sector.

ii. Provide a conducive eco-system to attract and encourage new investments.

iii. Provide opportunities to local entrepreneurial talents.

iv. The growth of MSME all potential sectors of the economy and focused on sustainable industrial growth.

v. Enhance the contribution of MSME's in manufacturing and services sector of the economy.

ISSUES DUE TO MINING & ITS IMPACT ON ENVIRONMENT

The continuing degradation of the natural environment by exploring above mentioned minerals poses one of the greatest challenges to modem societies. In particular all mining activities create a burden on the environment although paradoxically at the same time the revenues gained from these activities create the basis for our well-being.

Major problems include global warming, loss of biodiversity, water and air pollution, releases of persistent organic pollutants and other toxic substances and land degradation.

Mining operations may be categorized as either surface or underground.

A) Surface mining may be broadly defined to encompass open pit, open cast, quarry, strip, dredging and placer(hydraulic) mining.

B) Underground methods include pillar-and-stope, shrinkage stope, block caving and long wall mining.

Most mining operations (whether surface or underground) share a number of common stages or activities, each of which has potentially adverse impacts on the natural environment, social and cultural conditions, or the health and safety of mine workers.

Expansion within the mining and metallurgical sector leads to the development and economic growth of our country. The products of the sector (including metallic and non-metallic minerals, construction materials) are not only essential for construction activities and many industrial processes, but are also often a valuable source of foreign exchange earnings.

However, mining operations frequently involve a high degree of environmental disturbance, which can extend well beyond the extent of mineralized areas. This inturn profoundly influences the environmental, social and health impacts of mining developments, as well as the economic viability of developing a given mineralized zone. The challenges with Environment Assessment of mining projects are twofold firstly, to ensure that environmental, social and health costs are afforded adequate consideration in determining the economic viability and acceptability of the project; and secondly to ensure that adequate mitigation or protection measures are incorporated into project design.

This requires both effective environmental legislations and enforcement by regulatory institutions and sound environmental management practices by private and public sector mine operators. In order to minimize the adverse impacts of mining it is desirable to adopt eco-friendly mining technology. Restoration of mined areas by re-vegetating them with appropriate plant species, stabilization of the mined lands, gradual restoration of flora, prevention of toxic drainage discharge and conforming to the standards of the air emissions are essential for minimizing environmental impacts of mining in such a state like Odisha having enormous mineral potential.

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Chapter - 13

TRANSPORT & COMMUNICATION

13

TRANSPORT & COMMUNICATION

Transport and communication is the basic infrastructural requirement for achieving rapid economic development. Adequacy of infrastructure in transport and communication sector is crucial for attracting investment. The ongoing economic reforms, therefore, attach high priority to development of transport and communication infrastructure.

The Industrial Policy, 2015 accords special priority to infrastructural development which in turn would facilitate flow of funds for large investments in the industrial sector. Development of transportation infrastructure is also essential for marketing of agricultural products and enabling the farmers to get a fair price. State Government have, therefore, accorded high priority for all round development in Transport and Communication Sector.

In the absence of adequate internal rail linkage, road communication is the major means for movement in many parts of Odisha. As good roads improve the accessibility of the rural people to markets and facilitate better delivery of services, emphasis is being given to provide all-weather road communication to inaccessible areas and upgrade the existing road network.

Odisha has a network of roads, railways, airports and seaports. Bhubaneswar is well connected by road, rail, and airways with the rest of India. Some highways are getting expanded to four lanes. Plans for metro rail connecting Bhubaneswar and Cuttack have also started.

ROAD TRANSPORT

Road transport in Odisha consists of well-connected National Highways, State Highways & other connecting roads. National Highways are constructed & maintained by National Highways Authority of India (NHAI), where as the construction & maintenance State Highways are developed and maintained by State Govt.

Some of the major NHs are NH 16, NH 316, NH 516, NH 18, NH 20, NH 520, NH 26, NH 49, NH 149, NH 53, NH 353, NH 55, NH 57, NH 59 etc.

The state highways include SH 1 to SH 55.

Odisha State Road Transport Corporation (OSRTC)

Odisha State Road Transport Corporation or OSRTC is the state owned road transport corporation in the eastern Indian state of Odisha. It is acknowledged for its distinguished service for safe and lowest cost of operation.

The Odisha State Road Transport Corporation (OSRTC) established under the Odisha State Road Transport Corporation Act. (1950), commenced its business of passenger transport services from 1974.

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Road Map of Odisha

RAIL TRANSPORT

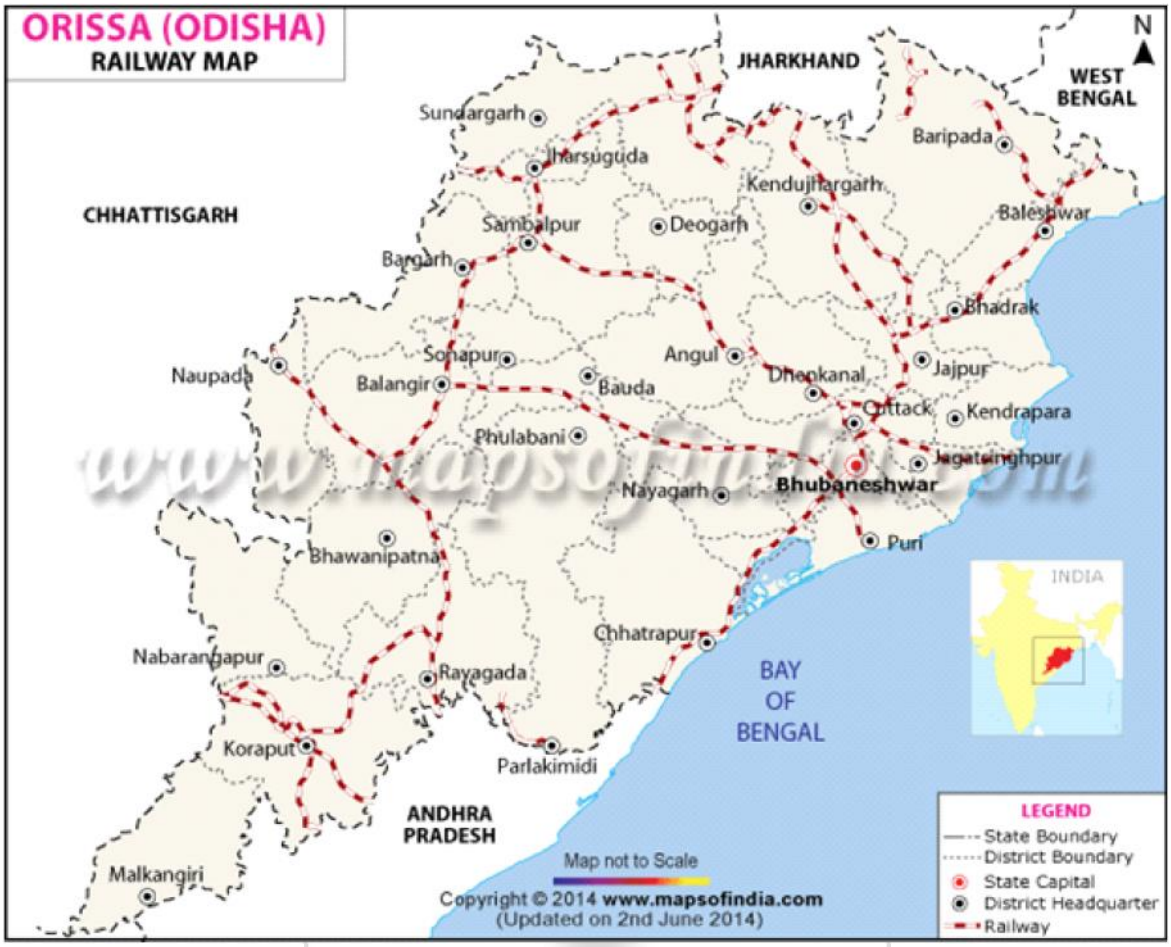
Rapid Industrialisation of Odisha is an inalienable part of India's growth story. Endowed with vast natural and mineral resources, the State of Odisha continues to be one of the most sought after investment destination with unabated interest by steel, aluminium, power, oil and cement companies.

In this context, the railways serve not only as important industrial infrastructure but also as critical linkages to spur socio-economic growth in the under-developed hinterland. The role of railways as a low-cost, high-volume carrier of bulk cargo over long distances is the vital cog in the entire wheel of transportation, logistics and supply chain management in addition to providing succour to the travelling public.

The East Coast Railway (ECoR) is one of the seventeen railway zones of Indian Railways. It came into existence on 1 April 2003. As the name suggests, most of the railway routes of the zone are near the east coast of India. The geographical jurisdiction of East Coast Railway zone extends over three states encompassing almost all of Odisha along with parts of Srikakulam, Vizianagaram and Visakhapatnam districts of north eastern Andhra Pradesh and Bastar and

Dantewada districts of Chhattisgarh state. The zonal headquarters is at Bhubaneswar in Odisha. The zone has three divisions: Sambalpur, Khurda Road and Waltair.

Railway Map of Odisha



AIR TRANSPORT

Odisha has been well connected to rest of the parts of India by Biju Patnaik International Airport, Bhubaneswar. Besides Odisha has a total of 17 airstrips and 16 helipads. The Government of Odisha have announced to develop an airport at Jharsuguda, making it a full-fledged domestic airport. Five greenfield airports were also to be upgraded at Angul, Dhamra, Kalinganagar, Paradip and Rayagada in an effort to boost intra-State and inter-State civil aviation. Existing aerodromes at Barbil, Gopalpur, Jharsuguda and Rourkela were also to be upgraded. Air Odisha, is Odisha's sole air charter company based in Bhubaneswar.

- Angul - Savitri Jindal Airport
- Bhawanipatna - Utkela Airstrip
- Bhubaneswar - Biju Patnaik International Airport
- Brahmapur - Berhampur Airport
- Cuttack - Charbatia Air Base

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- Jeypore - Jeypore Airport
- Jharsuguda - Jharsuguda Airport
- Rourkela - Rourkela Airport
- Sambalpur - Hirakud Airstrip

WATER TRANSPORT

Odisha's long coastal region has an added advantage of water transport. There are many sea ports in the long seacoast of Odisha. Paradeep is one major port of Odisha, through which minerals and metallurgical products are exported. The export activity through this port is in increasing trend. Some of them are:

- Port of Paradip
- Port of Dhamara
- Port of Gopalpur
- Port of Subarnarekha
- Port of Astarang
- Port of Chandipur

1. Paradip Port

Paradip Port is an artificial, deep-water port on the East coast of India in Jagatsinghpur district of Odisha. It is situated at confluence of the Mahanadi River and the Bay of Bengal. It is situated 210 nautical miles south of Kolkata and 260 nautical miles north of Visakhapatnam.

The port is administered by the Paradip Port Trust an autonomous corporation wholly owned by the Government of India with a major port status.

2. Dhamra Port

The Dhamra Port is a newly developed Port in Bhadrak district, Odisha, India, on the shore of the Bay of Bengal about seven kilometers from the old port of Dhamra. The agreement to develop the port was signed in April 1998.

The Dhamra Port Company Limited (DPCL) was formed as a result of a 50:50 joint venture between Larsen & Toubro and TATA Steel to run the port. The Port received its first vessel on 8 February 2010 and the first commercial vessel on 10 April 2011. The Port has an initial capacity of 25 million tonnes annually, eventually growing to 80 million tonnes annually. The port is managed by Adani group.

3. Gopalpur Port

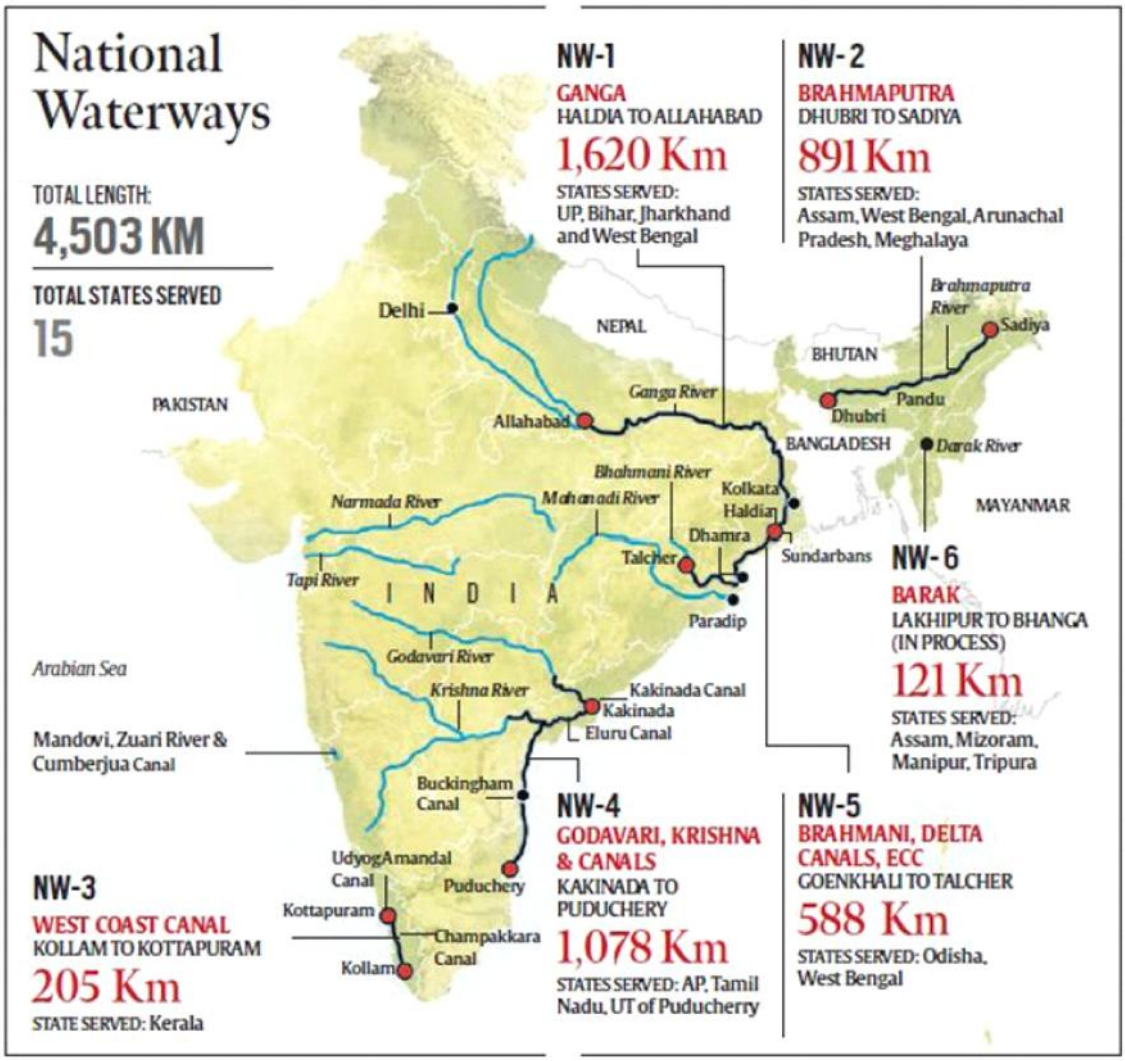
Gopalpur Port on the East coast in Ganjam district in the southern part of Odisha, India. Once a commercial port, it is now a famous sea beach and tourist destination around 15 km from Berhampur. The port is managed by TATA group.

INLAND WATER TRANSPORT

There are 111 designated National Waterways (NWs) in India identified for the purposes of inland water transport, as per The National Waterways Act, 2016. Out of the 111 NWs, 106 were created in 2016. The NW network covers around 20,275.5 km. NW-1, 2, & 3are already

operational. Cargo as well as passenger / cruise vessels are plying on these waterways. Detailed Project Report (DPR) for development of NW-4 & 5 was completed in 2010. The DPR of NW 5 was updated in 2014. For the newly declared 106 NWs, techno-economic feasibility studies have been initiated.

National Waterways



1. NW 5

   Talcher-Dhamra Stretch of Brahmani-Kharsua-Tantighai-PanduaNala-DudheiNala-KaniDhamra-river system, Geonkhali-Charbatia Stretch of East Coast Canal,harbatia-Dhamra Stretch of Matai River and Mahanadi Delta Rivers, length 588 km.

2. NW 14

   Baitarani River, length 49 km

3. NW 22

   BirupaBadiGengutiBrahmani River System, length 156 km

4. NW 23

   BudhaBalanga River, length 56 km

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GOVT. SCHEMES

PRADHAN MANTRI GRAM SADAK YOJANA (PMGSY)

Realising the importance of rural connectivity, the Government of India launched a major rural road connectivity programme named "Pradhan Mantri Gram Sadak Yojana (PMGSY)". The prime objective of PMGSY is to provide connectivity to unconnected villages in rural areas by way of all-weather road, with necessary culverts and cross-drainage structures.

RURAL INFRASTRUCTURE DEVELOPMENT FUND (RIDF)

Development of infrastructure in the transport and communication sector is an essential pre-requisite for accelerated economic development. The recent Government policies with emphasis on liberalization and globalization, are aimed at attracting foreign investment in the infrastructure sector.

CONNECTIVITY PROGRAMME UNDER RLTAP FOR KBK DISTRICTS

KBK region is one of the most backward regions in the country. Poor road connectivity is the important facet of its backwardness. In order to improve connectivity in KBK districts, Special Central Assistance (SCA) has been made available since 2001-02.

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Chapter - 14

REGIONAL DEVELOPMENT & PLANNING

14

REGIONAL DEVELOPMENT & PLANNING

Planning is a device of achieving socioeconomic prosperity by optimum utilisation of the available natural and human resources. In other words, planning is a process of socioeconomic development to make space (region) habitable and to keep the ecology and environment in a healthy condition.

In India, the main objectives of planning is to eradicate poverty, ignorance, diseases, and inequalities of opportunities and providing a better and higher quality of life. The objectives of planning are also to provide social justice, distribution and judicious utilisation of natural resources and to maintain the resilience characteristics of physical resources.

The process of planning in India was started during the period of the Freedom Movement. The National Planning Committee was set up in 1938 by the then Indian National Congress under the guidance of Mahatma Gandhi, Subhash Chandra Bose, and Pandit JawaharLal Nehru. Planning in India made good progress immediately after Independence. The three basic directive principles of planning policy of India as given in the Constitution of the country are:

(i) That the citizens, men and women, equally, have the right to adequate means of livelihood;

(ii) That the ownership and control of material resources of community are so distributed as best to sub-serve the common good; and

(iii) That the operation of economic system does not result in the concentration of wealth and means of production to the detriment.

Thus, the planning policy in India was directed mainly towards accelerating the pace of social and economic development alleviating poverty and unemployment; improving standard of living and quality of life, an egalitarian society with equal opportunities to all individuals of both sexes, of all regions, of all religions and of all castes without any discrimination.

Some of the examples of regional planning, their success and failure have been discussed below:

1. Damodar Valley Project:

The Damodar Valley Project was designed on the pattern of Tennessee Valley Corporation (USA) which was implemented in 1948. This regional project was designed to control floods, to generate electricity, to provide irrigation in the plain areas, to control soil erosion, to develop tourist places and to use the available mineral and other resources judiciously. It is an important example of river basin management and regional planning. Thus, it is largely a success story of regional planning in India.

2. Western Ghats:

The Western Ghats stretches over the states of Gujarat, Maharashtra, Goa,Karnataka, Tamil Nadu and Kerala. A regional plan to consider the issues of afforestation, soil erosion and conservation, hydel power development, plantation agriculture, mineral resources development, wildlife protection and biodiversity conservation was prepared. The region lost its biodiversity and became a biodiversity hotspot. The region has been included in the UNESCO World Heritage List in July, 2012.

3. The Dandakarnaya Project:

This project includes the tribal areas of Chhattisgarh, Odisha and Jharkhand. The objective of this project was to resettle the refugees from Bangladesh (erstwhile East Pakistan) through integrated planning with special reference to tribal interests. The project was implemented by the Dandakaranya Development Authority. Overall this project was unsuccessful.

Regional Dimensions of Planning

The planning process in India, however, remained highly centralised for all these sixty years with little decentralisation.

The Damodar Valley Corporation (DVC) and the National Capital Region (National Capital Region) continue to be the two significant regional planning efforts of the country. Both were outside the domain of Five-Year Plans, as in both the cases inter-state boundaries were crossed.

Regional Planning

Planning is a process to achieve certain objectives and goals. Regional planning is neither economic planning, nor physical planning alone. It is a synthesis of physical, social, economic, political, and cultural interests of the concerned region. It has to deal with the concerned region not in isolation, but in integration with other regions constituting the regional space as a whole.

Integrated Rural Development Programme (IRDP)

The Integrated Rural Development Programme (IRDP) was launched by the Janta government in 1978 79, by bringing together the Community Area Development Programme (CADP), Drought Prone Area Programme (DPAP), Small Farmer Development Agency (SFDA), and Marginal Farmers and Agricultural Labourers Agency (MFALA).

The main objective of Integrated Rural Development is to eradicate poverty, hunger and unemployment from rural India. It is a centrally sponsored scheme with funds shared on 50:50 basis between the Centre and the states. The programme was intended to generate gainful employment for all able-bodied persons in rural areas within a period of about ten years by introducing such schemes as would help development of production potential of each area, and utilisation and upgrading of the human skills available. The aims of the programme are listed below:

1. To provide assistance in self-employment opportunities.
2. To give assistance to a target group of rural poor, belonging to the families below the poverty line, in the form of subsidy. The target group under IRDP includes labourers, artisans, scheduled castes,scheduled tribes, sharecroppers, and marginal and small farmers.

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3. To take up measures for livestock and poultry development, fishery, and social forestry in the village.
4. To promote cottage industries in the village to enhance the per capita income of the targeted group and to raise the standard of living of weaker sections of the rural population.

In 1999, the Government of India launched a restructured poverty alleviation programme for rural areas which replaced the IRDP and its allied schemes by the Swarnjayanti Gram Swarozgar Yojna (SGSY).

The main objectives of the Swarnjayanti Gram Swarozgar Yojna are as under:

1. A holistic programme covering all the aspects of self-employment such as organisation of the self help groups, credit, training, technology, infrastructure, and marketing.
2. To make every assisted family rise above the poverty line in three years.
3. The income of the assisted families should be more than two thousand per month.

Development of Backward Areas

Identification of backward areas is a difficult task. In general, any area with relatively low per capita income and low per capita consumption is known as backward area. At the time of formulation of theFive-Year Plan (1966-71), the Planning Commission appointed a Study Group to suggest the criteria for identifying backward areas. The group suggested the following criteria for the identification of backward areas:

1. Total population and the density of population.
2. Number of workers engaged in agriculture including agricultural labourers as percentage, to workers.
3. Total area per agricultural worker.
4. Net area sown per agricultural worker.
5. Percentage of total irrigated area, to net irrigated area.
6. Percentage of area sown more than once, to net sown area.
7. Per capita (rural population) gross value of agricultural output.
8. Establishments (manufacturing and repair) using electricity:
   (i) Total
   (ii) Household
   (iii) Non-household
9. Number of workers per lakh of population employed in registered factories.
10. Mileage of surface roads
    (i) Per 100 sq km
    (ii) Per lakh of population
11. Number of commercial vehicles registered in a district.
12. Percentage of literate population.

13. Percentage of school going children: (i) boys, and (ii) girls.
14. Number of seats per million population for technical training: (i) craftsmen, and (ii) diploma level.
15. Hospital beds per lakh of population.
16. Per capita income.

Command Area Development

The Command Area Development Programme was launched in 1974-75 with the set objectives of improving the utilisation of created irrigation potential and optimising agriculture production and productivity from irrigated agriculture through a multi-disciplinary team under an Area Development Authority. It is about the command areas of the major and medium irrigation projects in the country.

The programme was restructured and termed as "Command Area Development and Water Management (CADWM) Programme" from 1 April 2004.

This programme was initially introduced in 60 major and minor projects including the Indira Gandhi Canal Command Area in 1974. Subsequently, the Command Area Development Programme was spread over 110 districts in 13 states, covering about 15 million hectares of irrigated agricultural land. Financial assistance is provided to the state governments on 50:50 basis for the construction activities.

The main objectives of the Command Area Development and Water Management Programme are as under:

1. Warbandi or the rotational system of water distribution.
2. Construction of field channels and field-drains to reduce the water pilferages and effective utilisation of water for irrigation.
3. Land levelling for the uniform spread of irrigation water in the field.
4. Demonstrations and training to farmers to diffuse technical know-how and for the adoption of new agricultural innovations for developing suitable cropping patterns, as well as improved farming practices and maintaining soil fertility.
5. To prepare a plan for the supply of inputs, credit, seeds, fertilisers, insecticides and pesticides.
6. To promote ancillary activities like animal husbandry, forestry, poultry, marketing, and processing facilities.
7. Repair, renovation, and restoration of water bodies.
8. Diversification of agriculture to make it more profitable and sustainable.
9. To give more emphasis to the cultivation of oil-seeds, pulses, and green-manure crops
10. To introduce participatory management of irrigation.
11. Reclamation of the water-logged areas rendered useless in the irrigated command areas.
12. Adaptive trials and demonstrations, training of farmers, etc.

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Watershed Management

Watershed is defined as any surface area from which rainfall is collected and drains through a common point. It is synonymous with a drainage basin or catchment area. The size of watershed may vary from few hectares to several thousands of hectares.

Watershed sizes are classified into three: micro, mini, and macro watersheds. In fact, watershed is a biological, physical, economic and social system. It is a land mass bounded vertically by the area influenced by human activities and horizontally by the water that drains into a point in the channel.

Watershed management is the integration of technologies within the natural boundaries of a drainage area for optimum development of land, water, and plant resources to meet the basic needs of the people and animals in a sustained manner.

The objectives of watershed management are

- To effectively conserve soil, rainwater, and harness the surplus water to create water sources in addition to groundwater recharge.
- To promote sustainable farming and stabilise crop yield by adopting suitable cropping and crop management systems.
- To cover non-arable area effectively through afforestation, horticulture and pasture land development based on the capability of land.
- To enhance the income of the individuals by adopting alternative enterprises.
- To restore ecological balance.

The principles of watershed management are:

- Utilising the land according to its capability based on land use classification.
- Conserving as much rainwater as possible at the place where it falls i.e., in situ conservation.
- Draining out excess water with a safe velocity and diverting it to storage structure (farm ponds, tanks) for future use.
- Avoiding gully formation and putting up check-dams at suitable places to control soil erosion, to store rain water and recharge groundwater.
- Identifying a suitable cropping pattern for the watershed area.
- Maximising productivity per unit area, per unit time and per unit water.
- Increasing cropping intensity and land equivalent ratio through intercropping and sequence cropping.

Safe utilisation of marginal and waste lands through alternate land use systems such as agro-forestry. Ensuring sustainability of the ecosystem benefiting the man-animal plant-land-water complex in the watershed.

- Stabilizing total income and cutting down risk during aberrant weather situations.
- Improving infrastructural facilities with regard to storage, transportation and marketing.

The watershed management is a comprehensive programme to utilise the available water and other resources in such a way that the productivity of agriculture is enhanced; to protect and

enhance water resources, moderate floods and reduce sitting up of tanks and conserve rainwater for crops and thus mitigate droughts; and to utilise the natural local resources for improving cottage and small industries to improve socio-economic conditions of the local people.

The National Water Policy 2002 lays emphasis on the integrated water resource development for:

(i) Optimal and sustainable utilisation of available surface and ground water.

(ii) Creation of well-developed information system.

(iii) Water conservation and demand management.

(iv) Quantity and quality aspects as well as environmental consideration.

(v) Involvement of beneficiaries in the project planning, and participatory approach in water resource management.

(vi) Adequate training and research.

(vii) Rehabilitation of project affected persons.

(viii) The policy also encourages private sector participation in the development and management of water resource projects.

Area Development Programmes

The area development plans are prepared to overcome the specific problems of the area with the help of the available physical and human resources. Some of the important area development programmes are: (i) Hill Area Development Programme, (ii) Desert and Drought Prone Area Development Programme, and (iii) Tribal Area Development Programme. Brief description of these programmes has been given as under:

Hill Area Development Programme

Nearly 18 per cent of the total area of the country is hilly and mountainous in which over 70 million people are living. The hilly areas generally have poor accessibility. The soils on the slopes are thin, less productive and subject to severe soil erosion.

For the purpose of area development the hilly areas have been classified under two categories:

(i) The Hilly Areas which are along the boundaries of the states and the Union Territories: This category includes the states and union territories of the North-Eastern Region, Jammu and Kashmir, Himachal Pradesh and Uttarakhand. These are termed under Special Category whose outlays are met, substantially, out of the Central assistance.

(ii) Hilly Areas which form a Part of a State: The developmental plan of such areas is prepared, implemented and financed by the respective state governments. The districts of Rajasthan situated in Aravallis, the hilly districts of Chhattisgarh, Jharkhand, Madhya Pradesh, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, etc., fall in this category.

The major thrust of the hill area programme is on the indigenous resources of the hills through the specially designed programmes for the development of the following:

1. Agriculture—shifting, sedentary, plantation (tea, coffee, spices, rubber, coconut, pineapple, etc.).

2. To develop horticulture, especially banana, apple, grapes, mangoes, and citrus fruits.

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3. To promote animal husbandry, poultry, bee-keeping, sericulture, and piggery.
4. Strategy to conserve soil.
5. To promote cottage and village industries.
6. To provide employment to the rural youths.
7. To strengthen co-operatives and farmers' service societies.
8. In the hilly areas having hot and humid climate where shifting cultivation is practiced, special programmes have been designed to stop Jhuming.

Tribal Area Development

Numerically, the most important tribes of India are Gonds (8 million) the Bhils and the Santhals, each having a population of more than 35 lakhs. Next to them are the Minas, the Mundas, and the Oraons; each having a population of more than 10 lakhs. Then come the Hos, the Khonds, and the Kols; each having a population of more than five lakhs. Then there are 45 tribes, each having a population of between one and five lakhs. The smallest tribal community is the Jarawa and Sentales of the Andaman and Nicobar Islands.

Areas of Development

1. Education
2. Employment
3. Agriculture
4. Co-operation
5. Communications
6. Land Distribution and Land Alienation
7. Industrialisation
8. Tribal Development Agency Projects

Moreover, industrialisation in tribal areas created two complex problems:

(i) Firstly, establishment of large industrial projects in tribal areas has caused a large scale displacement of tribal, and

(ii) Secondly, tribal population is assuming more and more migratory character and tribal life is getting disintegrated.

It is unfortunate that, in spite of specific safeguards provided in the Constitution for the tribal's protection and development, most of them have not only remained neglected, but an exploited lot.

Desertification and Desert Development Programme

The term desertification was coined by the French forester Aubreville in 1949 to describe land degradation. Since then there have been over 100 published definitions of this controversial term which gained prominence after the 1977 UN Conference on Desertification.

In the Convention to Combat Desertification (1995), desertification is defined as and degradation in arid, semi-arid, and dry-sub-humid areas resulting from various factors including climatic variations and human activities. The problem is therefore confined to the susceptible dry-

lands, with land degradation regarded as soil erosion, internal soil changes, depletion of ground water reserves and irreversible changes to vegetation communities. In many respects, desertification is no different than land degradation occurring world-wide, except that it specifically refers to its occurrence within dry areas.

Desertification is a serious global problem, affecting 16 per cent of the total population, about 34 per cent of the land area and 70 per cent of all dry-lands of the world.

Though the Convention to Combat Desertification (CCD) definition includes possible multiple causes for desertification, it is undoubtedly the case that the principal agent of degradation is human actions.

Desertification involves four processes that have an extensive impact on the biological productivity of desert land. They are:

(i) degradation of vegetation cover,

(ii) soil erosion,

(iii) salinization, and

(iv) Water- logging including soil compaction.

Some of the glaring aftermath effects of environmental degradation are:

1. Loss of global biological diversity,
2. Loss of biomass and bio-productivity,
3. Exhaustion of humus reserve,
4. Disrupting normal global bio-geochemical turnover and reduction on the global carbon-dioxide sink,
5. Desertification contributes to climatic changes by increasing potential and decreasing actual evapotranspiration rate,
6. Changing ground-surface-energy budget and adjoining air temperature, and
7. Adding dust and carbon dioxide to atmosphere.

Drought and desertification are closely linked. Water shortages and high rainfall variability make: desertification more acute. This, in turn, promotes drought and intensifies its effect. Ecological degradation processes are set in through excessive destruction of natural vegetation. It is only during prolonged periods of drought that the above mentioned processes lead desertification.

The ecological consequences of long-term rainfall deficits are:

(i) elimination of grass cover,

(ii) elimination of some bush vegetation,

(iii) drop in ground water- table near the surface,

(iv) an increase in shifting sands and reactivation of some old sand dunes,

(v) more wind erosion of fine soil components, and

(vi) increased evaporation, with drying out of soils cracking on clay soils.

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Desertification Control in Arid Lands of India:

Desertification is a serious problem in the arid dry- lands in India. It is more severe in the north-western plains of the country, especially in the Thar Desert of Rajasthan, Gujarat, Haryana and Punjab. Wind erosion is a major problem in part of the desert. Higher average wind speeds, dominantly sand terrain, sparse vegetation cover and high human activities on the sand-dunes and sandy-plains lead to accentuation of sand-blowing. It also leads to erosion of top soil, containing nutrients and precious little organic matter as also moisture, thereby reducing soil quality required for sustainable agricultural production.

To control desertification several measures have been taken, which are as follows.

1. Sand-Dune Stabilization
2. Shelter-belt Plantation
3. Soil & Water Conservation Measures
4. Management of pastures
5. Contour Farming
6. Ravine Land Reclamation

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Chapter - 15

EMERGING PROBLEMS & PROSPECTS

15

EMERGING PROBLEMS & PROSPECTS

The State of Odisha presents a paradoxical picture of poverty amidst plenty. Despite being endowed with vast human and natural resources and achieving substantial progress in many areas during the past 50 years of planned development. Odisha continues to be one of the less developed States plagued by acute and persistent poverty.

High dependence on the low productivity primary sector has resulted in significant fluctuations in the growth rate from year to year with a bad crop year pulling it down. The State of Odisha is prone to multiple hazards. One calamity or other hits the State every year. Before recovering from the trauma of super cyclone of October 1999, the State was hit by a severe drought in the year 2000-01 followed by unprecedented floods during rainy season in the year 2001. Subsequently in the year 2003-04, the State was also ravaged by severe floods in a prolonged spell of nearly two months. The visitation of such severe natural calamities in quick succession has exacerbated the financial crisis faced by the State Government.

Besides cyclone Phailin in the year 2013 was powerful cyclonic storm after 1999 super cyclone. Though its impact was visible all over Odisha, sourthern district Berhampur and nearby areas were more severely affected. Also cyclonic storm Hud hud in the year 2014 which hit the Andhra coast had its impact on Odisha.

Odisha has enormous growth potential in terms of natural resources as well as human resources. Odisha has long coastline of 480 kms with 24,000 sq. kms. of continental shelf area along the Bay of Bengal. It is also endowed with 6.70 lakh hectare of inland fresh water area and 4.18 lakh hectare of brackish water area which provide enormous potential for fish production.

In the mineral side, Odisha is one of the richest States having Chromite, Nickel, Bauxite ore and Coal deposits. But in contrast, to this richness in natural resources, Odisha continues to be an underdeveloped State. Thus, economy of Odisha reflects a paradoxical situation of poverty amidst plenty.

The main factors contributing to the under-developed status of Odisha economy are the undiversified economy, low level of investment, slow economic growth and frequent occurrence of natural calamities.

Odisha economy heavily depends on the primary sector. Since the main constituent of the primary sector is Agriculture and Allied Activities which is susceptible to shocks caused by drought conditions and other natural calamities, the overall macro economy has become prone to instability. Apart from this, because of inadequate investment in private sector and thereby slow industrialisation process, dependence of the state economy on primary sector is not reducing.

However in the last two decades some positive changes have taken place in the State economy. The dominant development strategy of the State during the Tenth Plan was the sustained efforts to encourage private sector investment for rapid industrialisation.

The Revised Industrial Policy, 2001 was put in place to reduce bureaucratic and procedural bottlenecks and to create an investment friendly industrial environment in the State to attract entrepreneurs. Simultaneously, State pursued a pragmatic fiscal and administrative reform process and continued with the high Government investment in social sectors. This policy shift has already created a positive impact on the economy as well as on human development scenario.

Industrialisation

The process of industrialization in Odisha has been slow rendering the economy to depend heavily on primary sector in general and Agriculture and allied activities in particular. In order to change this impasse and transform the industrial sector to become the main engine of growth, State put in place a liberalized Industrial policy Resolution, 2001.

While promoting private sector participation in industries, this policy resolution also aims at ensuring quality, productivity and skill development in industrial sector. Besides steps have been taken for the development of supporting infrastructure facilities like power, railways, telecommunications, ports, airport, road network etc. This apart, the State Government organizations like IPICOL, IDCOL, OSFC and OSIC have been making concerted efforts to promote private investment in manufacturing, mining and infrastructure projects in the State under realized policy regime. The efforts of the State Government have already started rendering results.

The Industrial Policy Resolution 2015 has been formulated to create a conducive environment through an enabling Policy and regulatory framework to drive sustainable industrial growth in the State. The State is committed to simplify the processes and procedures and expedite project approvals and clearances.

Priority sectors have been identified with additional incentives. Industries both existing and upcoming are expected to avail the benefits as per IPR 2015 and create employment opportunities, augment revenue in the State. The Policy focuses on providing quality industrial infrastructure, creation of a large land bank, financial assistance to the private sector for development of industrial infrastructure and sustainable environmental protection measures by the MSME Units. The emphasis of the policy is to make Odisha “a destination of choice” for industrial enterprises.

As per the advanced estimates for the year 2015-16, the share of the broad Industry Sector to GSDP of Odisha is 36.56 percent as against 33.08 percent for the year 2013-14.

Agricultural Growth

With 65% workforce, directly and indirectly engaged in agriculture sector, Odisha remains an agrarian economy. But the agricultural practices remain very traditional and dependent on rainfall. The overall productivity of the sector is, therefore, low as compared to the agriculturally developed states like Punjab and Haryana.

The State is continuously trying to bring about technological and structural improvement in the thrust areas of agriculture sector to counter the climatic uncertainties, uneven distribution of precipitations during monsoon; traditional practices of operation etc.

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There is need to promote cash crops; develop small and medium irrigation facilities and harness available ground water resources, educate farmers on adoption of advanced technology and implement, land reform measures in the state to ensure increased agricultural production and productivity.

Accordingly, the State Agricultural Policy, 2013 envisages more income generation in agricultural sector; extensive application of advanced farming technology; creating better environment for entrepreneurships in the agro-based and food processing industries; self-sufficiency in producing fruits, vegetables, flowers, poultry and dairy products and extension of irrigation potential up to 50% of total cultivated area of the State. The Policy resolves to ensure efficient production and management of quality seeds, fertilizers, bio-fertilizers, making available of soil health cards to farmers, soil reclamation, crop insurance, promotion of fisheries and animal resources etc. The new Policy visualizes revamping the existing administrative structure and establishment of Agricultural Aid Centres at the block level. Agriculture has been given the status of industry since the enactment of the Agricultural Policy, 1996.

Fisheries & Livestock Development

Animal resources and fisheries sector has greater employment opportunities and income generating potential in Odisha. Rivers along-with 480 kms. long coastline of Odisha has considerable potential for inland and marine fish production that can boost exports to generate income for the State. Incorporating fishery development as a major policy measure, the State Agricultural Policy, 2013 emphasizes on adoption of scientific methods of pisciculture, provision of assistance to fishermen, intensive fishing operation in deep sea, training of fishermen on pisciculture and capture.

As per Basic Animal Husbandry Statistics 2014, Odisha ranks 11th among Indian states in egg production, 13th in meat production and 16th in terms of milk production. Next to Agriculture, Animal Husbandry is the most important economic activity in rural areas.

Power

Power sector reform in Odisha has succeeded in making it a power surplus State. The problem areas in power sector are it's over dependency on Hydropower projects which is prone to Climatic uncertainties, transmission loss and resource crunch. The dependence on Hydropower is however reducing gradually with generation of more and more of thermal power. The State is promoting power generation by encouraging private investment in the sector envisaged under Odisha Electricity Reform Act, 1995. The present Demand (Estimated) in 2015-16 is 2934 MW, Availability of power from different sources is 2901 MW, While the installed capacity is 5593.61 MW.

The State Government is also keen to promote renewable and eco-friendly non-conventional sources of energy.

Road Transport

Road transport plays the anchor role in economic development of the State, because of limited network of other modes of transport like railways, airways, and water ways. The sector generates substantial revenue for State exchequer.

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Introduction of a State Transport Policy is under active consideration of the State Govt., which would aim at ensuring efficiency, expansion and transparency in transport administration andmanagement.

Poverty & Standard of Living

Poverty has been the most intractable problem of the State and primary concern of the State Government. Odisha exhibits large scale poverty both in terms of intensity and extent of spread. This has adversely affected the overall human development in the State. The angel's ratio, which indicates standard of living in an increase way, is very high in Odisha. Taking note of this, the State government has been pursuing a multi pronged strategy for poverty alleviation. Apart from the normal target group oriented poverty alleviation programmes State Government has been focusing on poverty reduction among depressed social groups like Scheduled Castes and Scheduled Tribes and backward areas like KBK region.

A Poverty Task Force (PTF) has been constituted, which is actively examining the nature of poverty in the State and advising the Government in specific measures that need to be taken. The State Govt. has also been giving thrust on generation of adequate gainful wage employment opportunities for unorganized labour force, development of social sector, infrastructure base and provision of universal access to the Basic Minimum Services like health care, education, sanitation etc. that would ensure an acceptable human development index and quality of life for the people of Odisha.

Besides, the state has made significant progress in organizing Self Help Groups to promote entrepreneurship and employment, which is helpful in reducing extent of poverty in rural areas. These measures have generated a positive impact. The Human Development Index (HDI) value, indicative of overall development in Human development has improved.

Unemployment and under employment

Large scale unemployment and under-employment is the main cause of poverty. The unemployment situation arises when the growth in labour force outstrips the new employment opportunities coming up in the economy, which has been the case in Odisha.

As. the state has been successful in controlling population growth the decadal growth has come down to 14.05% as compared to all India average of 17.72% (DGR). It is expected that annual addition to the labour force will come down because of this thereby reducing the size of unemployment to some extent. Another outcome of this which has become a matter of serious concern is the growing joblessness among the educated youth. This calls for higher level of investments to create more gainful employment opportunities.

But the issue needs to be approached at regional and sectoral level rather than at macro level. The solution to this problem lies in labour intensive rural development and wage-employment programmes. Capital intensive Industrialization process will certainly have a positive impact in reducing unemployment among skilled manpower. But, it is equally important that theState needs to emphasize on extending agro based industries which have more spread effect. State Government have launched an Employment Mission to address the unemployment problems in the State.

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Education

The literacy rate of Odisha (72.9%) is close to all India rate (72.98%). Low women literacy rate and high drop out of children at primary education level are major factors responsible for low level of human development index. The State Government is therefore, emphasized more on primary education. The State has launched various schemes for achieving reduction in dropout rates with focus on Scheduled Caste, Scheduled Tribe and girl students.

Health Care

The Infant Mortality Rate (IMR) is a crucial determinant of human development. Because of effective Government intervention, the IMR has improved in the State. Attempt is being made to increase significantly the per capita expenditure on health sector including family welfare, water supply and sanitation. The Tenth Plan emphasized, on improved access to health care facilities in rural and tribal areas. The State Government have launched an Infant Mortality Reduction Mission.

Non-Economic Factors

The non-economic factors which are also creating problems of economic development of Odisha include:

1. Lack of efficient administrative machinery.
2. Leakage of funds as a result of corrupt practices.

The efficiency in administration can be enhanced if sincere endeavour is made by the top administrators. It is difficult to check corrupt practices because corruption has entered into bones and tissues of the politicians who are in badly need of extra money for expensive election expenditure and also for their uncertain future position in the next election result. Although every state has its own share of special problems, Odisha may be described as one of the major problem state with its proneness to natural calamities, higher poverty ratio, alarming unemployment rate and other factors.

PARAMETERS OF DEVELOPMENT

There are three parameters of development:

(i) Natural Environment (ii) Technology (iii) Institutions

(I) Natural Environment

Natural environment indicates the direction of economic development. The areas endowed with rich natural resources have more, opportunities for development at the given level of technology. On the other hand, areas poor in natural wealth remain underdeveloped. Natural environment also decides the type of economic activity carries out by the inhabitants of a particular area. For example, people in the river valleys practise agriculture lumbering is practised in forested regions and fishing in the coastal regions.

(ii) Technology

It is the art of interacting with the environment. The extent of production levels in all these activities are limited by the level of technology available to the people in the respective regions. Technology has its own characteristics. Primitive technology is size neutral and is available to all irrespective of their income levels. Intermediary technology is size biased and is available only to those who have

some investible surplus. Sophisticated and large scale technology has to be brought under social control because of its high cost. This large scale technology is available to all irrespective of their size after a nominal payment. The intermediary technology creates disparities in income within a social group and across the regions.

(iii) The Institutions

The institutions have been created by human beings for accelerating the pace of economic development. Institutions should be modified and changed with the passage of time because rigid institutions cause deceleration rather than acceleration of the pace of economic development.

The level of economic development is the function of the harmonious interaction between natural environment, technology and the institutions created in a region.

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Chapter - 16

ENVIRONMENT

16

ENVIRONMENT

INTRODUCTION

The State of Odisha (Orissa) with a geographical area of 15.57 million hectare has a population of nearly 36.71 million (2011 Census). The recorded forest area in the State stands at 58,136.87 Sq. Kms., which accounts for 37.34% of the geographical area. The forests are concentrated mostly in Central, Southern and Western parts of the State.

Forest occupies an important position in the economy of the State, particularly among rural and tribal masses. It contributes towards their food security and day-to-day livelihood. The pressure on forests for fuel wood, small timber and grazing in most places is must more than the carrying capacity of forests. Hence the forests are prone to the threat of degradation

The Forest and Environment Department in the State operates through a number of departmental formations and autonomous bodies. The field formations under the Forestry set up are organized under Forest, Wildlife and Kenduleaf wings. Organizations such as State Pollution Control Board, Chilika Development Authority and Regional Plant Resource Centre function under the Environment Wing of the Department. Odisha Forestry Sector Development Project (OFSDP) is being implemented with the assistance from JICA (Japan International Cooperation Agency), in 14 Forest & Wildlife Divisions (2006-07 to 2014-15). The objective of the Project is to restore degraded forests and improve the income level of villagers by promoting sustainable forest management, including JFM plantation and community tribal development, thereby improving environment and alleviating poverty.

Department of Forest and Environment undertakes different activities for protection, regeneration and extension of forest and tree cover in the State in participatory mode with involvement of local people for ameliorating the micro climate as well as environmental management and conservation. National Forest Policy 1988, Odisha Forest Sector Vision, 2020 and Joint Forest Management Resolution, 2011 provide guiding principles for forest management in the State.

As per the report of the Forest Survey of India using remote sensing techniques, the forest cover in the State is 48,855 sq. kms of which 7,073 sq. kms is very dense forest. The moderately dense forest extends over 21,394 sq. kms while open forest is over 20,388 sq. kms. The forest cover in the State constitutes 31.38% of the geographical area. Besides this, there exists tree cover outside the forest over 2.85% of the geographical area of the State. Thus the forest and tree cover in the State is 34.23% of the geographical area. The Department is constantly endeavoring to protect the forest area, regenerate the degraded forests and create more forests and tree cover by way of afforestation.

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The forests in the State are rich in biodiversity. There are two National parks, 18 Sanctuaries and one Biosphere Reserve in the State. There are two notified and one proposed Tiger Reserves namely Similipal, Satkosia and Sunabeda (proposed).There are three elephant reserves in the State namely Mayurbhanj, Sambalpur and Mahanadi. The protected area for wildlife management constitutes 4.25% of the total geographical area of the State

The wetland management in the State has received International accreditation. Chilika Ramsar site is the Asia's largest brakish water lagoon having rich esturine and marine fauna including 152 Irrawaddy dolphins (as per 2013 Jan, census). About nine lakh migratory birds visit Chilika every year. Gahirmatha Sanctuary attracts more than five lakh Olive Ridley sea turtles every year for nesting during Feb- March.

Forest Map of Odisha	
GEOGRAPHICAL AREA	15.5 MILLION HA
TOTAL HUMAN POPULATION	35.6 MILLION
TOTAL LIVESTOCK POPULATION	
RECORDED FOREST	5.8 MILLION HA (37% OF TOTAL LAND AREA)
RESERVED FOREST	47% OF TOTAL FOREST
PROTECTED FOREST	52.7 OF TOTAL FOREST
UNCLASSED FOREST	LESS THAN 1% OF TOTAL FOREST
ACTUAL FOREST COVER	4.7 MILLION HA (30% OF TOTAL LAND)
DENSE FOREST	55% OF TOTAL FOREST
OPEN FOREST	44% OF TOTAL FOREST
MANGROVE FOREST	1% OF TOTAL FOREST
PER CAPITA FOREST	0.18 HA
DEGRADED FOREST LAND	ALMOST 50% OF FOREST LAND
AFFORESTATION DONE OVER(1951-2000)	1.83 MILLION HA
TOTAL NATIONAL PARK	2
BIOSPHERE RESERVE	1 (SIMLIPAL TIGER RESERVE)
TOTAL WILD LIFE SANCTUARY	18
MARINE SANCTUARY	GAHIRAMATHA OLIVE RIDDLEY SEA TURTLE
FIRST RESOLUTION ON JFM	1988 FOLLOWED IN 1993,1996
TOTAL JFM COMMITTEE (1999-2000)	11020
TOTAL AREA UNDER JFM (1999-2000)	6 LAKH HA
TOTAL FOREST REVENUE (1999-2000)	Rs.868 MILLION (APPROX) OR 1.5% OF STATE REVENUE
TOTAL FOREST REVENUE (1999-2000)	11020
TIMBER & FIREWOOD	Rs. 64.5 MILLION
BAMBOO	Rs. 85.2 MILLION
KENDU LEAF	Rs.635.0 MILLION
OTHERS	Rs. 83.3 MILLION

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STATE OF THE FORESTS:

According to the State Forests Report, 2005 published by the Forest Survey of India, Deharadun and actual Forest cover in the State is 50,354 Sq. Km. This constitutes 34.90% of State's geographical area. Out of this:

(i) Very Dense Forest (with crown density above 70%) 7,023 Sq. Kms

(ii) Moderately dense Forest (Crown density 40% to 70%) 21,470 Sq. Kms

(iii) Open Forest (with crown density of 10-40%) 21,861 Sq. Kms.

Total 50,354 Sq. Kms

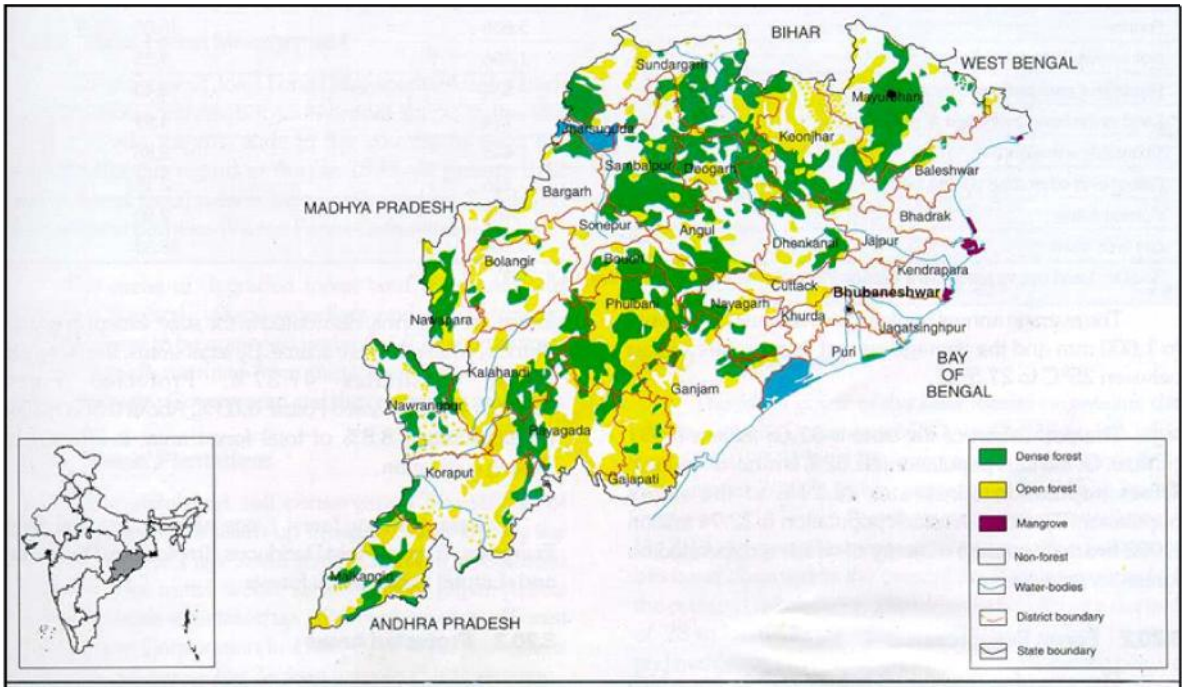
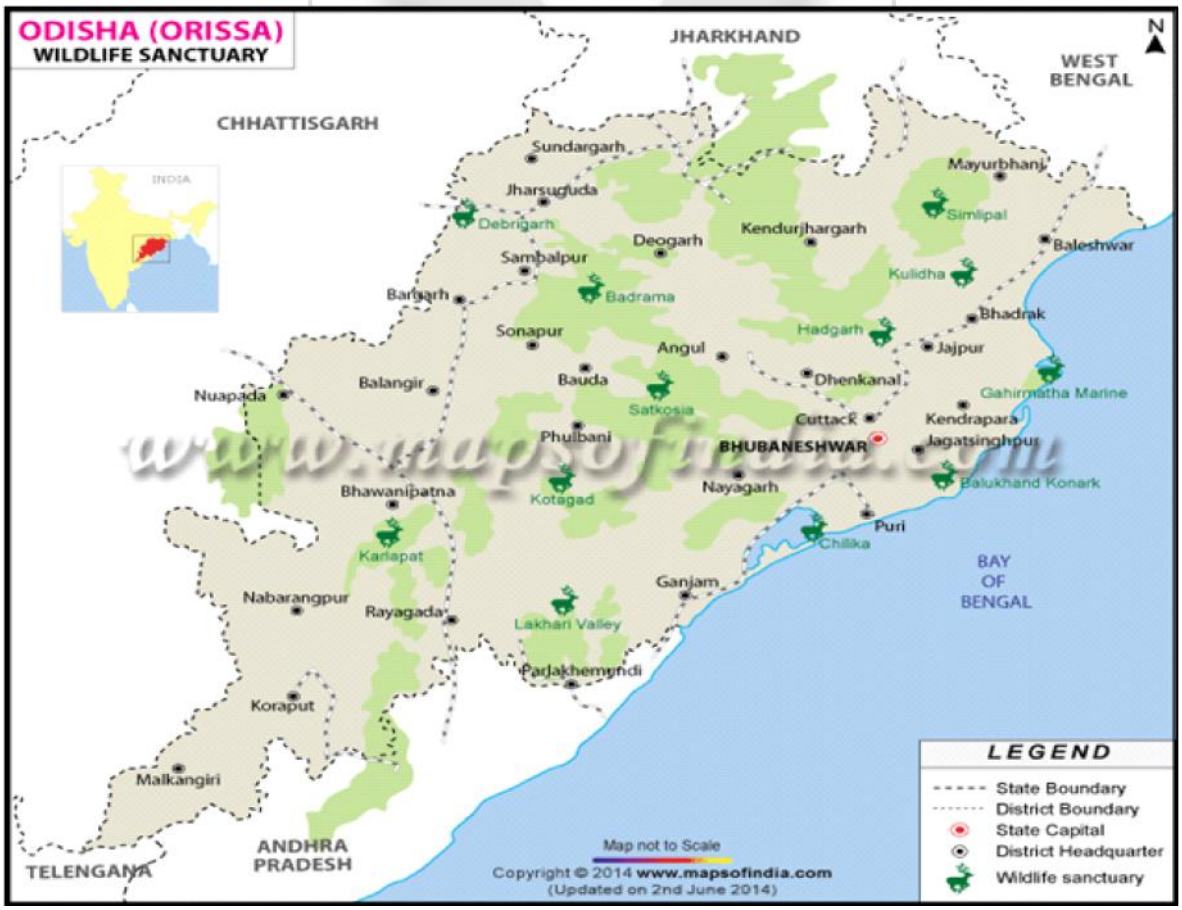


Fig. 3.19 Forest cover of Orissa



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WILDLIFE, ECOLOGY AND ENVIRONMENT:

Odisha with its diversified topography and climate has been the abode of rich bio diversity and a variety of wildlife species.

(a) Wild Life Sanctuaries and National Parks:

The total protected area in the State is 8352.19 sq km, which constitutes 5.36 percent of the total geographical area. There are 19 wildlife sanctuaries, 2 national parks, 1 Zoological Park at Nandankanan, Bhubaneswar and 2 mini Zoos. Besides, there are two tiger reserve and three elephant reserve in the State. Similipal has dense forests and hills and is home to a wide variety of wild animals, reptiles and birds.

Bhitarkanika is a wetland and one of India's finest coastal ecosystems. It has rich mangrove area on the deltaic region of the river Bhrahmani and Baitarani and is crisscrossed by creeks and rivulets. After Sundarbans, it is home to the second largest mangrove "forest" in India. UNESCO has bestowed the world heritage status to Bhitarkanika.

(b) Tigers and Elephants

Odisha has two "notified" tiger reserves; the Similipal Tiger Reserve in Mayurbhanj district and the Satakoshia Tiger Reserve in Angul district. With the help of new technique of Camera Trap method introduced by National Tiger Conservation Authority (NTCA) and Wild Life Institute of India (WLI) scientists calculated the presence of 45 tigers during January 2006 to February 2008. This number has come down to 28 in the census undertaken during 2014-15 which further increased to 40 during 2015-16. Leopard population in the State was recorded at 318. There are 3 Elephant Reserves in the State, located in Mahanadi and Sambalpur. Elephant population during 2010-11 was 1886, which increased to 1930 during 2012-13 in 2014-15 it is recorded as 1954.All Odisha Elephant census, 2015 conducted throughout the State.

(c) Turtles

The mass nesting sites of Olive Ridley sea turtles are located at Gahiramatha Sanctuary. During 2015-16 nesting season 0.52 lakh Olive Ridley Sea Turtles visited Odisha coast for mass nesting as against 4.13 lakh in 2014- 15. At Rusikulya River mouth 3.09 lakh turtles nested in the year 2014-15.The State Government is giving top priority for the safety of these turtles. Under Integrated Coastal Zone Management Project, 10 river squads at Bhitarakanika and 2 patrolling boats at Rushikulya have been engaged for protection of Olive Ridley sea turtles.

(d) Migratory Birds

The winter welcomes many avian guests to Chilika, Bhitarakanika and other water spread areas in the State. Chilika lagoon receives over 7.5 lakh birds every year. Nalabana, island inside Chilika lagoon is an abode of avifauna and becomes a paradise for the migratory birds in winter. Avian species like pintail, gull- billed tern, common sand pipers, bar headed geese, grey leg geese, spotted eagle and osprey are some of the species of migratory birds. Increased awareness, improved protection measures and surveillance have reduced hunting of these birds.

Man Animal Conflict:

Because of accelerated developmental activities and promotional aspects of Industries added with biotic pressure has created a challenge for protection of wild life and its habitat, as a result

human and wild life conflicts occur quite often. Man-animal conflict has been an increasing concern for Odisha in recent years. Depletion of dense forest areas has led to life and food insecurity of wild animals, elephants to be specific. Death & injury of people & domestic animals, mass damages of houses & crop areas etc by elephants & other wild animals rise with serious concern. Crop areas were damaged due to elephant attacks mostly in forests and forest adjacent villages /towns of the State.

In order to minimize this conflict and to protect the life and property of human beings, the steps taken are:

- Day and night patrolling is being carried out in forest and wild life area. Steps have also been initiated for constituting a 63 member "special tiger protection force" for Similipal forests.
- An Elephant Corridor Development Management Plan in 14 elephant corridors has been implemented to reduce man- elephant conflict.
- Creation of 191 water bodies and renovation of 270 numbers to prevent death of wild animals due to water scarcity.
- Trench facing over 31 RKM and solar facing over 79 RKM has been created to prevent wild animals entering human habitations.
- Provisions of 158 forfeiting squads and modem forfeiting tools have been made in order to prevent fire incidences.

Anti-Encroachment and Poaching Measures:

Like elsewhere, encroachment and poaching remain a threat to wildlife in the State. The State Government has taken several steps to address these problems. Some such measures taken up are as follows:

- For conservation of threatened marine turtles and other marine fauna in coastal districts 5 off shore and 52 on shore camps have been established.
- To provide safety to migratory birds, protection camps have been set up comprising villagers, volunteers and wildlife officials in and around Chilika Lake.
- Special Tiger Protection Force (STPF), deployment of 63 Forest Guards made for protection of Similipal and Satkosia tiger reserves respectively.
- 349 Anti Poaching squads have been deployed at strategic locations for prevention of poaching to wild animals.

Environment and Pollution Control Policy Initiatives:

Protecting environment and maintaining ecological stability are the most challenging issues facing almost all regions of the world. Major policy initiatives and actions undertaken by the State in this regard are summarized below.

State Pollution Control Board (SPCB):

The SPCB functions under the administrative control of the State Forest and Environment Department and ensures the implementation of the Environmental Acts, particularly the Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981 and the Environment

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(Protection) Act, 1986. In addition, the Board implements the Hazardous Waste (Management, Handling and Trans boundary Movement) Rules, 2008; the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989; the Bio-medical waste (Management and Handling) Rules 1988, the Batteries (Management & Handling) Rules, 2001 and the plastic waste (Management & Handling) Rules 2011, the c-waste (Management & Handling) Rule 2011, other pollution controlling rules and regulations. The achievements of SPCB during 2015-16 are given below:

Granted consent with stipulation of appropriate pollution control measures to 893 industries, hotels, and brick kilns etc. and also provided consent to operate to 2,856 industries, mines, hotels, mineral processing units etc.

- Public hearings have been conducted for 14 major industrial mining development projects which require environmental clearance from Government of India.
- 237 hazardous waste generating units have been granted authorization under the hazardous waste Rule 2008, for collection, storage, treatment and disposal of hazardous wastes.
- The Board has granted authorization to 556 health care establishments under provision of the Bio- medical (Management and handling) Rule, 1998 and also issued show cause notices to 86 units for inadequate management of Bio-medical wastes.
- Under the municipal solid waste (M&H) Rules 2000, authorization granted to 32 numbers of ULBs, Eleven numbers (11) of notices have been issued to the ULBs for the noncompliance of the above rule.
- Awareness programme conducted by the Board on World Environment Day, International, Coastal Clean-up Day and National Pollution Prevention Day to create awareness on environmental protection among public.

The Odisha State Coastal Management Authority:

Ministry of Environment & Forests, Government of India have constituted Odisha Authonty (OCZMA) under the provision of Environment Protection Act, 1986 for protecting and improving the quality of coastal environment and preventing, abating and controlling environment pollution on the coastal areas. The district level coastal zone monitoring committees for all coastal districts have been constituted in order to enforce and monitor the coastal activities as envisaged in CRZ notification.

Centre for Environmental Studies (CES)

This is a registered society, whose aim is to promote environmental awareness in the State. The institute functions as regional resource agency for the National Environment Awareness Campaign (NEAC) and a nodal agency for the National Green Crops Programme.

CES is also the State Nodal Agent for National Green Cards (NGC) programme of Govermnent of India.

Chilika Development Authority (CDA)

Chilika is one of the important spot of biodiversity. It shelters a number of endangered species and migratory birds. The highly productive eco-system with its rich fishery resources sustains the livelihood of more than 0.2 million fisher folk living in and around the lagoon. Some of the important ongoing restoration activities taken up during 2015-16 include (i) Water exchange and salinity gradient of de-siltation in Chilika Lake, (ii) Bio diversity conservation and wise Zone use of natural

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resources, (iii) Fishery resource development, (iv) Strengthening of wetland research and training centre, (v) Management of Ansupa lake etc.

ADMINISTRATIVE SET UP

The Forest and Environment Department in the State operates through a number of departmental formations and autonomous bodies. The field formations under the Forestry set up are organized under the forest, Wildlife, and Kenduleaf Wings. The Orissa Forest Development Corporation (O.F.D.C.) Ltd. acts as the commercial wing of the Department and discharges the function of disposing of various forest produce viz. Kenduleaf, timber, bamboo. It also supplies timber, bamboo and firewood to the public through over 269 depots run by it.

FOREST & WILDLIFE WING:

Restructuring of the entire forest formation has been affected from the 1st October 2003 with a view to reducing overlapping functions, improving efficiency and integrating all forestry functions at the Divisional level. This will facilitate forestry extension activities and promotion of participatory forest management. After reorganization, the State has 7 Forest Circles and 37 Forest Divisions under the Principal Chief Conservator of Forests, 1 Circle and 12 Wildlife Divisions with territorial jurisdiction and Nandankanan under the Principal Chief Conservator of Forests (Wildlife)-cum-Chief Wildlife Warden. Besides, there are 3 Circles and 19 Kenduleaf Divisions under the Addl. Principal Chief Conservator of Forests (KL) engaged in collection and procession of Kenduleaves. There are 8 Working Plan Divisions, one Forest Resources Survey Division and two Silviculture Divisions looking into preparation of working plans, resource inventory and forest research respectively. There are five training institutions, viz. one Forest Rangers Training College, one Forester Training School at Champua, two Forest Guards TrainingSchools at Angul and G. Udayagiri and Social Forestry Training and Research Institute, Bhubaneswar. There are 221 Forest Ranges, 60 Wildlife Ranges in the State for protection and management of forest and wildlife. Besides, 165 K.L. Ranges have been formed in the State for collection and processing of Kenduleaves.

THE ENVIRONMENT WING:

The Environment Wing of the erstwhile Science, Technology and Environment Department became part of the Forest and Environment Department in October, 1990. The Environment Wing does not have any field formations. Besides, the Directorate of Environment, the State Pollution Control Board constitutes the main agency of the Government. A Chilika Development Authority has been set up for the eco-restoration of Chilika Lake. The Regional Plant Resources Centre (R.P.R.C.) is a unique institution devoted to ex situ preservation and development of plant genetic resources of the State and development and application of micro-propagation technologies. A Centre for Environment Studies has been created during 2000-2001 by the State Government with the objective of disseminating environmental-linked information and creation of environmental awareness and taking up need based studies and consultancy assignments in the field of environmental impact assessment and environment management plans.

FOREST PROTECTION

With growing population there has been tremendous pressure on the forests both for forest produce as well as for forest lands. Consequent upon reorganization during the year, 2003, the State is divided into 281 (221 Forest and 60 Wildlife) Ranges, 1,001 Sections and 3,674 Beats. The average

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forest area per Beat comes to 15.82 Sq. Kms. For a forest Section, 58.07 Sq Kms. and for a range 206.88 Sq. Kms, which is considered to be quite high from the management point of view.

Illegal removal of forest produces is largely confined to some vulnerable areas, such as the forests on the basin of River Mahanadi spread over Sambalpur, Angul, Cuttack, Nayagarh and Boudh district, Similipal Forests in Mayurbhanj district, the forests of Rayagada, Koraput and Malkangiri districts in Odisha-Andhra Pradesh Border and the forest corridor in the Inter-State Odisha-Jharkhand and OdishaChhatisgarh Border.

The Forest Department has been keeping a close vigil over forest offences and taking action to bring the offenders to book. During 2008-2009 as per the figures reported up to October, 2008 the forest offence cases booked, offenders involved, timber and forest produce seized and approximate value thereof, cases booked under Section 56 of Odisha Forest Act, 1972 (Amended) and put to confiscation proceedings in the State are as follow:

NATIONAL PARKS AND WILDLIFE SANCTUARIES OF ODISHA:

BIOSPHERE RESERVE:

1. Similipal biosphere reserve.

NATIONAL PARKS:

1. Similipal National Park
2. Bhitarkanika National Park

WILDLIFE SANCTUARY:

1. Similipal Wildlife Sanctuary
2. Bhitarkanika Wildlife Sanctuary
3. Satkosia Gorge Wildlife Sanctuary
4. Hadagarh Wildlife Sanctuary
5. Baisipalli Wildlife Sanctuary
6. Nandankanan Wildlife Sanctuary
7. Kotagarh Wildlife Sanctuary
8. Chandka-Dampara Wildlife Sanctuary
9. Khalasuni Wildlife Sanctuary
10. Balukhand-Konark Wildlife Sanctuary
11. Kuldiha Wildlife Sanctuary
12. Debrigarh Wildlife Sanctuary
13. Lakhari Valley Wildlife Sanctuary
14. Chilika (Nalaban) Wildlife Sanctuary
15. Badarama Wildlife Sanctuary
16. Sunabeda Wildlife Sanctuary
17. Karlapat Wildlife Sanctuary
18. Gahirmatha (Marine) Wildlife Sanctuary

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ODISHA WILDLIFE CONSERVATION ACTIVITY:

Conservation and protection of wildlife and its habitats throughout the State has been given due importance with special attention to 20 Nos. of notified protected areas. The protected areas comprise of Bhitarkanika National park, Similipal Tiger Reserve, Satkosia Tiger Reserve, Gahirmatha Marine Sanctuary and 16 other Wildlife sanctuaries.

These 9 protected areas cover 9,009.82 Sq.Km. including 1,408 Sq. Km.of the coastal area. The total land area notified as sanctuaries and National park is 4.25% of geographical area of the State.

Main strategy of Wildlife Conservation:

- Wildlife Conservation issues are the main strategy in the Forest Management objectives and prescriptions laid down in the Working Plans meant for all the Forest Divisions of the State.
- A landscape approach being adopted to include the critical wildlife habitats, buffer zones and corridors.
- Intensive patrolling taken up in the areas with wildlife concentration to curb offences against wild animals.
- Habitat conservation measures such as preservation of rainwater by creating W.H.S. to provide water during lean period, forest regeneration through incentive based control of forest fire have also been introduced with the help of the neighboring villagers of the P.As.
- Specific incentive scheme to motivate local public against forest fire, poaching, etc. have been introduced with reward and incentive support.
- Enforcement of anti-poaching measures, Census and estimate of the numbers of carnivores, their prey animals.
- Improvement of measures like habitat Water and soil.
- Eco development programmes and organization of alternate livelihood,Motivation and awareness of local people
- Eliciting participation of students through nature camps and competitions.
- Capacity building of staff
- Development of telecommunication and road network and maintenance of other infrastructure.
- Research, planning and monitoring of wildlife population and spatial distribution.
- Management of ecotourism

TIGER CONSERVATION:

”Project Tiger”, a major wildlife-conservation initiative of Govt. of India, was launched in the year 1973 to save the Indian tiger from extinction. Similipal Tiger Reserve was one of the nine reserves chosen in the country to implement the project. With focus on the tiger, which is a ‘master predator’ and an ‘indicator species’ of the ecosystem, the project has paid attention to all issues relating to conservation of habitat in the tiger reserves.

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The population of tiger in Odisha has increased from 142 in 1972 to 192 in 2004. Though only 35% increase over 32-years, this is perhaps the best that could happen to tiger in the wild. The Elephant Reserve network comes in aid of the objectives of Project Tiger as the former encompasses tiger habitat also. Two additional areas, Sunabeda and Satkoshia-Baisipalli Sanctuaries, have come under the network of Tiger Reserves.

SIMILIPAL TIGER RESERVE:

- Similipal Tiger Reserve, in Mayurbhanj district holds about 50% of tiger population in the state. Sustained protection measures and management initiatives have resurrected the dwindling population of tigers to around 95 in the 1990s and therefore the population has remained stable around 100. Yet, most of the tigers from north Similipal are moving to south Similipal that remains a better habitat, and the leopards, more adaptable than the tiger, are appearing in most of the habitats vacated by tiger.
- These observations suggest that Similipal habitat may be reaching the maximum of its carrying capacity in tiger. The future seems depend on adjoining forests of Hadgarh and Kuldiha that are better known as elephant habitats. The Tiger Reserve exists from 1973, and the notification as per NTCA guidelines (2006-2007) has been issued by Government of Orissa, Forest and Environment Department.
- Tiger is only an indicator species but the project in Similipal has provided incidental conservation to the entire biota contained in these forests. The giant squirrel (Ratufa indica) of the upper tree canopy, the mugger crocodile (Crocodylus palustris) in the rivers of Similipal, and the 94-species of orchid flora are only a few that 'indicate' the positive impact of Project Tiger on the health of the ecosystem, and the prevailing microclimate of Similipal.
- Major threats to Similipal centre round four lakh people living in the periphery and ten thousand people living inside it. Most of them 'use' Similipal to make a living, and the population continues to rise at a rate of 20% for each decennial period. Similipal presents an accurate reflection of the declining status of a habitat in the face of growth of human population.

SUNABEDA TIGER RESERVE:

- Sunabeda (Proposed) Tiger Reserve has received 'in-principle-approval' of the National Tiger Conservation Authority. A proposal for its notification as per NTCA-guidelines is under preparation.
- The proposed TR extends over 956.17sq.km area in Nauapara district bordering the state of Chhatisgarh to the west of Odisha, and encompasses the Sunabeda Sanctuary (591.75Sq.kms) and the Patdhara forest block to its south (364.42Sq.kms). The reserve holds 36 tigers as per population estimate of January 2004. The Udanti and Sitanadi sanctuaries of Chhattisgarh on the west are almost contiguous with Sunabeda.
- The faunal characteristics of the proposed Sunabeda Tiger Reserve include a population of wild buffalo migrating between Odisha and Chhatisgarh. The status of the 'hard-ground Barasingha' endemic to the Sunabeda plateau is uncertain at present. The four major carnivores in the plateau are tiger, leopard, wolf and wild dog. The prey base of herbivores has sustained the rising trend of carnivore population.

THE SATKOSHIA-BAISIPALLI TIGER RESERVE:

- The Satkoshia-Baisipalli (Proposed) Tiger Reserve, encompassing the Satkoshia Gorge Sanctuary constituted in May 1976 and the Baisipalli Sanctuary constituted in November 1981, owes its conceptualization and status to the wetland fauna (Gharial, Mugger, freshwater turtles, freshwater shark etc.) in the Mahanadi and biodiversity in the terrestrial ecosystem.
- The TR is located in the Central Zone of Odisha and spreads over Angul, Cuttack, Nayagarh and Boudh districts covering an area of 963.87sq.kms and comprises of Moist Deciduous Forests, Dry Mixed Deciduous Forest, Bamboo Brakes, Dry Tropical Riparian Forest and Teak Plantations.
- Satkoshia Gorge is the home of the most endangered Gharial (Gavialis gangeticus), the Mugger crocodiles (Crocodylus palustris) and a variety of freshwater turtles. Other faunal elements include Leopard, Wild dog, Gaur, Nilgai, Sambar, Spotted Deer, Barking Deer, Bear, Ratel, Jackal, Porcupine, Indian Hare, and Giant Squirrel etc.

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- Both the resident as well as migratory birds are found in this sanctuary. The resident birds include the Hornbills, Peafowl, Kingfishers, Egrets, Cormorants, River Tern, Owls, Pigeons, Myna, Parakeets, Drongo, Doves, Woodpecker, Gulls, Golden Oriole, Vultures, Babblers, Barbets, Minivets, Sun Bird, Eagle, Crow Pheasants etc. The migratory birds include Brahminy Ducks, Bar Headed Geese etc.

ELEPHANT CONSERVATION:

Elephant is an animal included in Schedule-I of the Wildlife (Protection) Act, 1972. A complete ban on ivory trade was imposed in 1991. Project Elephant was launched in February 1992 by Govt. of India to consolidate the programmes for conservation of elephant and its habitat.

The Project seeks to address the following aspects:

- The threats to the survival of elephant in our country on account of loss of its habitat, migration path and poaching for tusks; and Issues arising out of elephant depredation in villages.
- To maintain an appropriate size of the population in any habitat to safeguard it against extinction; and
- To maintain genetic continuity of isolated populations, which are otherwise susceptible to interbreeding.

ELEPHANT RESERVE (ER) NETWORK:

Elephant Conservation Issues:

The factors impinging on conservation of elephants in Odisha fall under two distinct categories.

- Activities like hunting for tusks and killing by villagers in retaliation for depredation caused by single elephants or herds;
- Diversion of forest lands, mainly for mining of forest land, encroachment, and shifting cultivation leading to loss/ decline/fragmentation/degradation of elephant habitat.

"Because the elephant requires much larger home range than any other terrestrial animal, it is usually one of the first species to suffer the consequences of habitat fragmentation and destruction." Elephant Reserves offer hope to rejuvenate some of the fragmented habitats.

In the state of Odisha, where many forests are shared by the tiger and elephant, the establishments of ERs have raised the hope to unify fragmented tiger habitats as well.

Three Elephant Reserves (ERs): The Mayurbhanj ER, Mahanadi ER and Sambalpur ER were notified in the State in the years 2001 and 2002 to define the prime elephant habitats and to launch various management interventions for conservation of elephant.

The extent of notified and proposed forest blocks in these three reserves is 4129 sq. km, and the geographical area covered by these three reserves is 8509 sq. km. In order to include most of the remaining important elephant habitats within ERs, to

- redress the problem of rising number of cases of elephant depredation
- reverse the trend of habitat fragmentation and degradation

It is proposed (year 2004) to expand the area of Mahanadi and Sambalpur ERs, and to constitute new ERs called the Brahmani-Baitarani ER and South Odisha ER. As per the proposed constitution of the ER-network the maximum number of elephants will remain within the Reserves.

Captive elephants:

The History of Odisha provides evidences about a rich tradition of maintaining elephants in captivity. There are innumerable elephant sculptures in temples and caves, and the Maharaja of Puri is known as the “Gajapati”.

The changed scenario reflected on the families of ‘Mahouts’ who mastered the skill of elephant-maintenance. The mahouts have gradually vanished along with the disappearance of the tradition of keeping elephants.

Captive elephants are now maintained only in some of the ‘camps’ under State Wildlife Organisation. In Nandankanan the elephants are used for joy rides by visitors.

In Similipal, however, the elephants are used by staff moving for habitat for wildlife protection, when the roads get cut off in the rains or where ‘elephant power’ is required to be deployed.

CROCODILES CONSERVATION:

Crocodilians were threatened in India due to indiscriminate killing for commercial purpose and severe habitat loss until enactment of the Wildlife (Protection) Act.1972.

All three species of crocodiles Gharial (Gavialis gangeticus),Mugger crocodile (Crocodylus palustris) and saltwater crocodile(Crocodylus porosus) in the river systems of Odisha were on the verge of extinction by the seventies. Crocodiles were very few because of ever increasing human activity in

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the rivers and their other traditional habitats, and consequent reduction in the extent of habitable stretches. Also, the survival rate of the crocodile hatchlings in nature is low because of predation. Piecemeal efforts were being made from the sixties onwards to save the crocodile.

FAO Expert, Dr. H.R.Bustard engaged by UNDP/FAO and Government of India studied the prospects of crocodile rehabilitation, and based on his report and guidance a Crocodile Conservation Project was launched in 1975 in different States. The Gharial and Saltwater crocodile conservation programme was first implemented in Odishain early 1975 and subsequently the Mugger conservation programme was initiated, since Odisha is having distinction for existence of all the three species of Indian crocodilians. The funds and technical support for the project came from UNDP/ FAO through the Government of India.

The Project sought to make up the natural losses by death and predation through rear and release operation. This involved collection of eggs from the nests as soon as these were laid, incubation and hatching of these eggs in hatcheries under regulated conditions of temperature and humidity, rearing the young juveniles, marking and release of the young crocodiles into Nature in protected areas, and assessment of the degree of success in restocking any protected area with crocodiles released from the hatcheries. To accomplish these tasks, 3 separate research units were established at Tikarpara, Dangmal and Ramatirtha for the Gharial, Salt Water Crocodile and the Mugger, respectively. At the Nandankanan Biological Park, captive breeding plans for all three species were pursued.

MANAGEMENT OBJECTIVES:

The broad strategy adopted for rehabilitation of crocodiles was to protect them in their natural habitats, to rebuild the population quickly through captive breeding (rear and release), and to build up trained personnel for the job. The broad objectives of activities under crocodile project were the following.

(a) To protect the remaining population of crocodilians in their natural habitat by creating sanctuaries.

(b) To rebuild natural population quickly through 'grow and release' or 'rear and release' technique involving the following phases of operation.

- Collection of eggs from natural nests as soon as these were laid
- Incubation of these eggs under ideal temperature and humidity maintained in artificial hatcheries
- Hatching and rearing the young crocodilians in ideal captive-husbandry conditions
- Marking and releasing young crocodiles in protected areas, and
- Assessing the result of release along with protection of the released crocodiles.

(c) To promote captive breeding.

(d) To take-up research to improve management. Some of the major research activities have been in the following directions.

- Interpretation of the various types of data collected during survey and census.

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- Determination of parameters for maximum success in egg collection, egg incubation, hatching, rearing and release, including husbandry aspects on feeding, food conversion and growth.
- Study of habitat features and population structure.
- Study of behavioral biology including reproduction, thermo-regulation, feeding, water-orientation, locomotion etc.

(e) To build up a level of trained personnel for better continuity of the project through trainings imparted at the project-sites and through the erstwhile Central Crocodile Breeding and Management Training Institute, Hyderabad.

(f) To involve the local people intimately through the following:

- The development of a strong level of acceptance of the project by the people, by locating the projects in rural areas where people could both see and participate in the entire programme.
- Protect the immediate and long-term interests of fishermen who reside within the sanctuaries, and whose livelihood depends on fishing, if necessary, providing an alternative source of income that was not detrimental to the conservation aims.
- Extend the conservation programme to village-level, commercial crocodile farming, so that people could earn an income from conserving crocodiles and their habitats.

PROJECT SITES IN ORISSA:

During 1976, survey of salt-water crocodiles and Gharial crocodiles was conducted in the river system of Bhitarkanika area and in the Mahanadi, respectively.

To accomplish these tasks, 3 separate research units were established at Tikarpara, Dangmal and Ramatirtha for the Gharial, Salt Water Crocodile and the Mugger, respectively. At the Nandankanan Biological Park, captive breeding plans for all three species were pursued.

GHARIAL PROJECT AT TIKARPADA:

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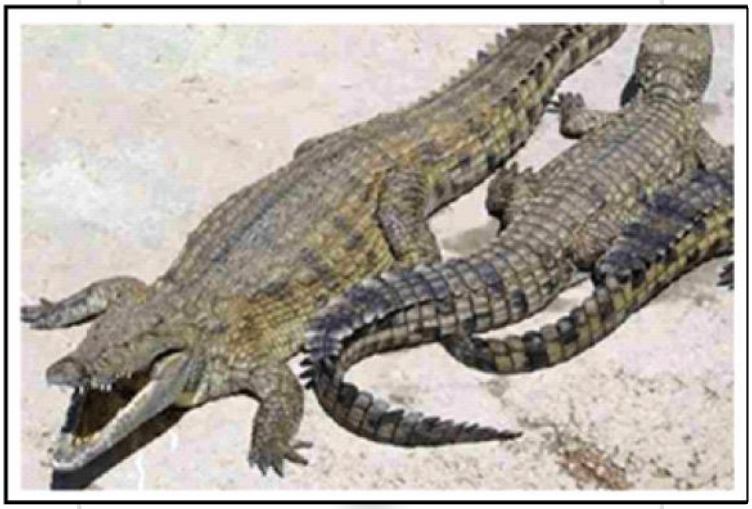
At Tikarpara, Gharial eggs were obtained at different points of time from Narayani and Kali rivers in Nepal and Chambal sanctuary in Madhya Pradesh, Rajasthan and Uttar Pradesh. The eggs collected from Mahanadi were infertile. Some hatchlings of Gharial were obtained from eggs incubated in Royal Chitwan National Park of Nepal and Katarniyaghat sanctuary in Uttar Pradesh.

All Gharials reared at Tikarpara and those produced from captive breeding at Nandankanan zoo, numbering more than 700, were released in the river Mahanadi between Boudh and Katrang.

For increasing the Gharial population to more viable levels it is absolutely essential to minimize fishing and navigation at least on certain stretches of the river. It has been under consideration to rehabilitate Gharials in Mahanadi up-stream of Hirakud reservoir, and some stretches of the river Brahmani.

The census conducted in winter-2004 in the river system of Mahanadi within the limits of Satkosia Gorge Sanctuary indicated survival only one male Gharial (3-3.5m length). This Gharial was located between Binikei and Majhipada of the river Mahanadi / SatkosiaGorge.

BAULA PROJECT AT DANGAMAL:



'Baula' is the Oriya term for Saltwater Crocodile. At Dangmal in Bhitarkanika sanctuary, salt-water crocodile eggs have been collected locally; and young crocodiles have been released in the creeks and the estuaries; and more than 2200 crocodiles have been released in phases since 1977.

This operation has been reasonably successful and the crocodile population in the Bhitarkanika river system has gradually been built up. Above 50 released female Saltwater Crocodiles have bread successfully and are laying eggs in the wild.

MUGGER PROJECT AT RAMATIRTHA:

The Ramatirtha center, meant for Mugger crocodiles, initially started with eggs and juveniles of Mugger procured from Tamilnadu. Since 1984 breeding of Muggers and the release of young ones into the nature in Similipal have been carried out, and so far more than 600 crocodiles have been released in Similipal.

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Census was conducted to ascertain the population status of Mugger crocodiles in the prominent rivers/water bodies inside the Similipal. The river wise census results have been indicated below.

MANAGEMENT IN THE WILD:

Since the prime objective of crocodile project is to rebuild their population in the wild, restocking the sanctuaries with captive reared crocodiles is an ongoing programme.

The resident and released populations of crocodiles are periodically monitored and the trend of nesting is also assessed.

Protection of crocodiles is a round-the-year activity. Measure threats are from intruding fishermen using nylon set nets.

Because of occasional reappearance of crocodiles in their former habitat that is now shared by increasing human population, there are occasional instances of nuisance crocodile. Such crocodiles are generally captured and shifted to some other river/creek or are brought back to captivity after careful consideration of the case histories and field conditions.

CAPTIVE BREEDING OF CROCODILES AT NANDANKANAN:

Captive breeding units on all the three crocodilian species have been established at Nandankanan Zoo. Muggers bred at Nandankanan Zoo have also been released in Satkosia Gorge. Although Gharials have failed in establishing in Satkosia Gorge, Muggers have settled down well in this stretch of Mahanadi River. As per survey carried in January to March 2004 there are 64 Muggers in Mahanadi system and 83 Muggers in the rivers in Similipal.

RESEARCH AND TRAINING:

In-house research has been conducted to standardize 'the rear and release' technique. Studies have been carried out to determine the appropriate method of population assessment, egg collection, egg incubation, hatching, and husbandry of the young crocodiles and various aspects of behavioral biology of the three species of crocodiles and their habitat features. The baseline data on Indian crocodilians and their management has been possible because of over 300 publications produced from these conservation projects.

Training has been imparted to all field staff employed in the project to help them to discharge their duties efficiently. Local people have been trained on how to bring live food for the hatchling in the pools. The Research Officers of this organization have availed of overseas training and have also

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conducted courses through the UNDP/FAO Programme. Based on their performance and contribution they have been in the steering committee and membership of the IUCN/ SSC Crocodile Specialist Group.

CONTRIBUTIONS:

All the three species of crocodiles have been saved from the brink of extinction, and many of their habitats have been brought under the protected area network of the State. The crocodile project that has since long come to a slow-pace in the State has contributed handsomely to develop the know-how and spreading of awareness. Future of the crocodiles can be secured with adequate protection of their habitats.

Apart from producing a large number of crocodiles in a short span, the Crocodile Project has contributed in various ways to the entire approach of wildlife conservation, research and training.

- Local people have been intimately involved in the management of crocodiles.
- Full time research personnel have been inducted into the wildlife wing to carry out research on crocodiles and other associated wildlife.
- Some important wetland sanctuaries have been created with crocodiles as the flagship-species.
- Active management of other wetland species began in conjunction with the crocodilians. These included the mangrove plants, marine turtles, freshwater turtles, monitor lizards, Gangetic dolphins, otters and other reptilian fauna.
- Along with the crocodile project there began an intimate overseas collaboration in the field of wildlife conservation, education and training.

CONSERVATION OF SEA TURTLES:

In coastal Odisha, the area of confluence of any river and the sea, which is the deltaic region, is a fascinating ecosystem. Also called intertidal area, this is criss crossed by estuary, rivers, creeks and creeklets.

The land in these estuaries is continually inundated by the saline sea water under influence of sea tide and also sweet water of river. Such lands are covered with mangroves, a kind of vegetation

endemic to these areas. The mangroves and the estuaries are the breeding and spawning grounds of varieties of marine life forms such as fishes, prawns, crabs and mollusks.

These life forms spend their juvenile stage in the mangrove estuarine ecosystem, and migrate to the sea in the later part of their lives. October to May is the period during which these juveniles are available in abundance in the estuaries and the coastal sea. This is the time for the sea turtles to congregate in these areas, having migrated over large distances in the sea to feed on these fishes etc. in the shallow sea near the intertidal regions.

During the months of October to May therefore, shallow sea near the river mouth becomes the feeding ground of the sea turtles, both for the adults and their juveniles. The sea turtles congregate and mate there and then look for suitable undisturbed beaches in these river mouth areas for laying eggs and nesting.

Based on these ecological conditions, certain pockets in the Odishacoast have become the famous mass nesting sites of the Olive Ridley sea turtles.

Significant populations of these turtles visit the congregation areas en-masse before the winter months for breeding and nesting. This is a yearly phenomenon. This population represents about 50% of the total world population of Olive Ridleys, and about 90% of the Indian population of sea turtles. Worldwide attention is naturally focused on these rookeries for conservation of this species.

Based on these ecological conditions, certain pockets in the Odishacoast have become the famous mass nesting sites of the Olive Ridley sea turtles. Significant populations of these turtles visit the congregation areas en-masse before the winter months for breeding and nesting.

LEGAL STATUS:

The Olive ridleys are Schedule I species under the Wildlife (Protection) Act, and are listed as 'endangered' in the IUCN Red Data Book, in the 'Appendix-I' of CITES (Convention on International Trade in Endangered species of wild Flora and Fauna), and also listed in the CMS (Convention on Migratory species). India being a signatory nation to all these conventions has the responsibility of protecting this species of sea turtle and its nesting beaches, breeding, feeding and congregation areas, as well as its migratory pathways in the sea.

PROGRAMMES AND ACTIVITIES:

- Declaration of Gahirmatha Marine Wildlife Sanctuary in September, 1997.

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- Formation of State Level Steering Committee for sea turtles under the chairmanship of Chief Secretary, Odisha in 1997.
- Declaration of three major turtle congregation sites (nesting and breeding grounds) at Gahirmatha (Dhamara river mouth), Devi and Rushikulya River mouths as 'No Fishing Zones' during the reproductive and nesting period.
- Use of 'Turtle Excluder Device' (TED) has to be mandatory in all trawl fishing nets.
- Regular patrolling of the nesting beaches and congregation-breeding zones in the sea by setting camps along the sea coast, and by patrolling in sea by trawler.
- Monitoring the nesting beaches against predators and human interference.
- Motivating local people in conservation of the breeding and nesting turtles.
- Awareness creation among the fishing community and local inhabitants

BLACKBUCK CONSERVATION:

The Indian Blackbuck (Antilope cervicapra), is one of the three species of antelopes found in Odisha. The other two are Nilgai (Boselaphus tragocamelus) and the Chowsingha (Tetracercus quadricornis).

All the three are even-towed (Artiodactyla) Bovids. Blackbuck is considered to be the fastest animal in the world next to Cheetah. There is a fast decline in the population of Blackbucks throughout the country due to poaching and habitat loss. In the recent past, this endemic animal was most numerous, commonly seen as a large wild mammal in the Indian subcontinent. Subsequently within a short span of time this animal has suffered much reduction in numbers. Blackbuck is included in the Schedule-I of Wildlife (Protection) Act, 1972 and is designated as Vulnerable as per Red Data Book (1994).

The Balipadar-Bhetnoi area comprising of about 70 villages of Buguda, Aska and Kodala Forest Ranges in Ganjam District. The Blackbucks of Balipadar-Bhetnoi area is protected religiously by the local society. The belief that the presence of Blackbuck in the paddy fields brings prosperity to the local villager has contributed greatly to the conservation of this species. The villagers do not kill the animal even if it strays into the fields and grazes their crop.

RAMASAR CONVENTION AND WET LANDS OF ODISHA:

- The Ramsar Convention (The Convention on Wetlands of International Importance, especially as Waterfowl Habitat) is an international treaty for the conservation and sustainable utilization of wetlands, i.e., to stem the progressive encroachment on an loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.
- It is also known as the Convention on Wetlands. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971.

Every three years, representatives of the Contracting Parties meet as the Conference of the Contracting Parties (COP), the policy-making organ of the Convention which adopts decisions (Resolutions and Recommendations) to administer the work of the Convention and improve the way in which the Parties are able to implement its objectives.

In 1981, Chilika Lake was designated the first Indian wetland of international importance under the Ramsar Convention.

Chilika has a pride of place in Odisha's literature and culture, and has influenced the poets and philosophers. It has held great significance for planners, scientists, international organizations like 'The Wetlands International' and 'Asian Wetland Bureau'.

In 2002, Chilika was taken out of the Montreux Record, in light of the improved conditions of the lake. Chilika lake is the first Ramsar site in Asia to be removed from the Montreux record.

CHILIKA LAKE:

Chilika lake is a brackish water lagoon, spread over the Puri, Khurda and Ganjam districts of Odisha state on the east coast of India, at the mouth of the Daya River, flowing into the Bay of Bengal, covering an area of over 1,100 km^2. It is the largest coastal lagoon in India and the second largest lagoon in the world. The lagoon itself can be broadly divided in to four natural sectors based on salinity and depth: the southern zone, central zone, northern zone, and the outer channel.

It is the largest wintering ground for migratory birds on the Indian sub-continent. The lake is home to a number of threatened species of plants and animals. The lagoon hosts over 160 species of birds in the peak migratory season. Birds from as far as the Caspian Sea, Lake Baikal, Aral Sea and other remote parts of Russia, Kirghiz steppes of Mongolia, Central and southeast Asia, Ladakh

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and Himalayas come here. These birds travel great distances; migratory birds probably follow much longer routes than the straight lines, possibly up to 12,000 km, to reach Chilika Lake.

GEOGRAPHY AND TOPOGRAPHY:

Several inland rivers, which bring silt into the lake, control the northern end of the lake. A 60 km long barrier beach called Rejhansa, formed by northerly currents in the Bay of Bengal, resulted in the formation of this shallow lake and forms its eastern side

Chilika Lake is a shallow bar-built estuary with large areas of mudflats. The western and southern margins of the lake are fringed by the Eastern Ghats hill range. The lake has numerous islands. The larger islands, separated by shallow channels, lie between the barrier and the main body of the lake. A total 42 km^2 (16 sq mi) of channels connect the lake with Bay of Bengal.The six major islands are Parikud, Phulbari, Berahpura, Nuapara, Nalbana, and Tampara.

WILDLIFE SANCTUARY:

Nalbana Island is the core area of the Ramsar designated wetlands of Chilika Lake. Nalbana means a weed covered island In the Odia language. It is a major island in the center of the lake and has an area of 15.53 km^2. The island gets completely submerged during the monsoon season. As the monsoon recedes in the winter, lake levels decrease and the island is gradually exposed, birds flock to the island in large numbers to feed on its extensive mudflats. Nalbana was notified in 1987 and declared a bird sanctuary in 1973 under the Wildlife Protection Act.

DRAINAGE:

The ecosystem features of Chilika comprising of tidal ingress from the sea, which mixes with the fresh water brought by rivers like Daya, Bhargabi, Luna, and large number of rivulets.

HUMAN HABITATION:

Several islands are situated in this lagoon, inhabited by large human population (1.3 lakh approx.) variously dependent on this wetland for sustenance. A number of villages and towns around the lagoon are closely associated with the wetland, in one way or the other for economic activities. About 70% of this population depends on fishing as the means of livelihood.

BIODIVERSITY:

The Chilika Lagoon is hot spot of rich Biodiversity. The ecological richness of the lake is of great value in preserving the genetic diversity because of the multiplicity of its habitat, flora and fauna. The Zoological Survey of India (ZSI) surveyed the lake between 1985 and 1988 and identified 800

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species of fauna, including many rare, endangered, threatened and vulnerable species, but excluding terrestrial insects.

The rare and threatened animal species identified are green seaturtle (EN)dugong (VU), Irrawaddy dolphin (VU), blackbuck (NT), Spoon billed sandpiper (CR), limbless skink and fishing cat (EN). 24 mammalian species were reported. 37 species of reptiles and amphibians are also reported.

FLORA:

There are 546 species of angiosperm plants belonging to 379 genera and 107 families, above 100 phytoplankton genera, 20 species of weed and 7 pteridophytic species documented so far in the Lagoon and the islands.

FAUNA

Chilika is very rich in both invertebrate and vertebrate fauna. This Ramsar site is the habitat for the largest congregation of waterfowls in India.

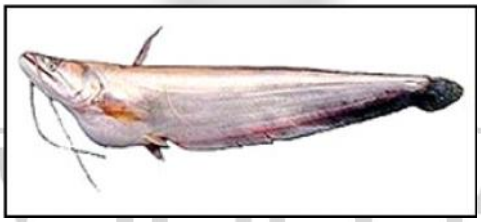
AVIFAUNA:

Chilika Lake is the largest wintering ground for migratory birds, on the Indian sub-continent. It is one of the hotspots of biodiversity in the country. Some species listed in the IUCN Red List of threatened animals inhabit the lake for at least part of their life cycle.

White bellied sea eagles, greylag geese, purple moorhen, jacana, flamingos, egrets, gray and purple herons, Indian roller, storks, white ibis, spoonbills, brahminy ducks, shovellers, pintails, and more.

Migratory water fowl arrive here from as far as the Caspian Sea, Baikal Lake and remote parts of Russia, Mongolia, Lakah, Siberia, Iran, Iraq, Afghanistan and from the Himalayas. A census conducted in the winter of 1997-98 recorded about 2 million birds in the lake.

AQUA FAUNA:



As per the Chilika Development Authority's (CDA) updated data (2002), 323 aquatic species, which includes 261 fish species, 28 prawns and 34 crabs are reported out of which sixty five species breed in the lake. 27 species are freshwater fishes and two genera of prawns. The remaining species migrate to the sea to breed.

Between 1998–2002, 40 fish species were recorded here for the first time and following the reopening of the lake mouth in 2000, six threatened species have reappeared, including:Milk fish,Indo-Pacific tarpon,Bream,Hilsa,Mullet

OTHER FAUNA:

The other vertebrate fauna includes:

- 321 species of fish and crab (fresh water, estuarine and marine species),

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- 7 species of amphibians,
- 30 species of reptiles (12 species of lizards and 18 species of snakes) and
- 18 species of mammals.

Two major crabs species (Scylla serreta and Neptunus pelagicus), available in Chilika are of commercial importance.

ENDANGERED SPECIES:

Most notable and endangered species also included in the Schedule-1 of the Wildlife Protection Act available in the lagoon are:

Barkudia insularis, a limbless lizard/skink (this skink is named after the "Barukuda" island of the lake)

- an aquatic mammal i.e., Irrawaddy dolphin,
- Fishing cat(Felis viverrina)
- White bellied sea eagle (Haliaeetus leucogaster)
- White spoon bill (Platalea leucorodia)
- Osprey (Pandion haliaetus)
- Spoon billed sandpiper (Eurynorhynchus pygmeus).

DOLPHINS:

The Irrawaddy dolphin (Orcaella brevirostris) is the flagship species of Chilika lake. Chilika is home to the only known population of Irrawaddy dolphins in India and one of only two lagoons in the world that are home to this species. It is classified as Vulnerable, in five of the six other places it is known to live.

A small population of Bottlenose dolphins, also migrate into the lagoon from the sea. Chilika fishermen say that when Irrawaddy dolphins and bottlenose dolphins meet in the outer channel, the former get frightened and are forced to return toward the lake.

Some Irrawaddy dolphins used to be sighted only along the inlet channel and in a limited portion of the central sector of the lake. A 2006 census counted 131 dolphins and the 2007 census revealed 138 dolphins.

Since 2004, the Whale and Dolphin Conservation Society has been conducting a science-based community education project to conserve the Irrawaddy dolphins and Chilika Lake. They have determined the primary cause of mortality for this population of dolphins is floating gill nets and hook line fisheries and the secondary cause is boat strikes from increasing unmanaged tourism activities

ARRIBADA OF OLIVE RIDLEY SEA TURTLES:

The mass nesting beach (rookery) along the Chilika coast is at Rushikulya which is located at the southern Odisha coast. It spreads over six km. stretching from the coastline in front of village Purunabandh (one Km north of Rushikulya river mouth) to the beach in front of Kantiagada village of Ganjam District.

THREATS:

Chilika Lake is threatened by siltation, eutrophication, change in salinity regime, proliferation of freshwater weed, increased aquaculture activities, changes in species composition, depletion of bio- resources, and decrease in fish population etc.

People have been using migratory birds arriving in Chilika for wintering as a source of protein supplement for quite some time. With the passage of time, this source of protein supplement has also become a source of livelihood for them. The inaccessibility of certain pockets due to weed infestation has boosted their activity as they find easy escape routes in these areas.

HYDROLOGICAL INTERVENTION

In a major intervention to manipulate the lake hydrology, a new mouth was opened near Ramabhartia in the year 2000 by the Chilika Development Authority (CDA), Bhubaneswar to let fresh ingress of seawater into the lake. The results of this intervention indicate that the salinity levels inside the lagoon have increased to certain extent in comparison to previous years, which apparently has led to decrease in the weed growth area and increase in fish catch. Impact of this manipulation (increased salinity level in the lake) on the ecosystem of the lake as a whole and Nalaban Sanctuary in particular and on the population of migratory birds / waterfowl in the lake needs closer assessment.

PROTECTION MEASURES:

In an innovative experiment to wean the poachers away from poaching, a massive awareness programme has been undertaken and bird protection committees have been formed. These committees assist the Forest Department in their protection efforts during the migratory season. In some areas, like Mangalajodi and Bhusandpur, the response from the villagers has been encouraging. These efforts are supplemented with the establishment of anti-poaching camps at

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strategic points along the coast line. To encourage eco-tourism, training camps for eco-guides and boat-man associations at Balugaon and Satpada are being organised.

HABITAT DEVELOPMENT

Habitat development inside the sanctuary is being done with funds received from Govt. of India and Chilika Development Authority. These measures include raising up of plantations, digging and renovation of creeks and ponds.

CONSERVATION AND MANAGEMENT STRATEGY

The State Environment Department and the Chilika Development Authority have taken several measures for conservation and management of this unique wetland and its rich biodiversity, with the support of the Ministry of E &F, Govt. of India. These measures include:

- Protection of migratory waterfowl and other species prone to poaching for meat.
- Catchments area treatment
- Weed control
- Restoration of the feeding and roosting habitat of water fowl
- Pollution control
- Creation of awareness about the values and functions of wetland
- Research and development activities
- Community participation
- Capacity building
- Building of Data base of the lagoon
- Promotion of eco-tourism

The changing profile of the lake has led to new challenges. The bird congregation, which was largely confined to Nalaban and other four to five areas, has now dispersed to peripheral areas such as Kalupada, Mangalajodi, and Bhusandpur, etc. This has posed a problem of protection of birds due to difficulty in accessibility of the area and constraint of resources. Increase in tourism inside Chilika has given rise to death of Irrawaddy dolphins, which may at a later stage be detrimental to the overall population of these endangered dolphins. This, however, has also offered opportunities

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to work hand in hand with other stakeholders working in the area for overall conservation of the lagoon.

Chilika Development Authority (CDA):

In 1992, the Government of Odisha, concerned by the degradation of the lake's ecosystem and cognizant of significant numbers of people who were dependent upon the lake's resources, set up the Chilika Development Authority (CDA). The CDA was set up for restoration and overall development of the lake under the Indian Societies Registration Act as a parastatal body under the administrative jurisdiction of the Forest and Environment Department, with the following charter:

- To protect the Lake ecosystem with all its genetic diversity
- To formulate the management plan for Integrated Resource Management and wise use of the lake's resources by the community depending on it
- To execute multidimensional and multidisciplinary developmental activities either itself or through other agencies
- To collaborate with various national and international institutions for development of the lake

The governing body of the Authority is headed by the Chief Minister of Odisha State and has people's representatives (Members of Parliament and Legislative Assembly), representatives of the fisher folk communities and secretaries of the key departments, experts and eminent scientists as its members.

BHITARKANIKA NATIONAL PARK:

Wildlife Sanctuary:

In a bid to conserve the complex and fragile mangrove ecosystem and the endangered flora, fauna associated with it, Govt. of Odisha Vide notification declared as a Sanctuary known as Bhitarkanika Wildlife Sanctuary. The area of the Sanctuary is 672 Sq. Kms.

National Park:

Subsequently, in the year 1998, the core area of Bhitarkanika Wildlife Sanctuary comprising of 145 Sq. Kms was declared as a National Park because of its ecological, faunal, floral, geomorphological and zoological association and importance and for the purpose of protection

Ramsar Site:

The area has also been designated as the second Ramsar site (i.e. Wetland of International importance) of the State during August, 2002. It is a unique area with rich biodiversity as it covers different ecosystems such as the landmass, tidal waterbodies of the deltaic region, estuaries and territorial waters of the Bay of Bengal along with their associated flora and fauna.

Biosphere Reserve (Proposed):

The deltaic region formed by the alluvial deposits of river Brahmani, Baitarani and Dhamara (Bhitarkanika) and the Mahanadi deltaic area, comprising of about 3000 Sq. Km. forms the proposed Bhitarkanika Biosphere Reserve. This deltaic region is a unique bioclimatic zone in a typical geographic situation in the coastal region of Bay of Bengal. It is located in the Kendrapara District of the State of Odisha.

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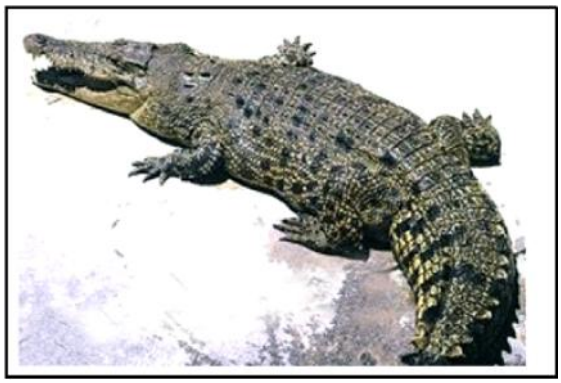

The proposed Bhitarkanika Biosphere Reserve covers erstwhile Kanika and Kujang Zamindari area. It includes at present three protected areas namely Bhitarkanika Wildlife Sanctuary, Bhitarkanika National Park and the Gahirmatha Marine Wildlife Sanctuary.

SPECIAL FEATURES:

The resilient mangroves serve the protective functions to a greater extent. It protects the hinterland against cyclonic storms during cyclones, super cyclones, tidal surges and other natural catastrophes acting as an effective shelterbelt. In the unprecedented super cyclone of October 1999, the mangroves has withstood the onslaught of cyclonic wind and saved the life and property of millions of people.

Mangrove wetlands perform a variety of productive as well as protective functions. This mangrove wetland in particular is a repository of biological diversity in terms of flora and fauna.

This ecosystem harbours the largest number of saltwater crocodile population in the Indian sub-continent. Other reptilian fauna include Monitor lizard, Indian python, King cobra and varieties of other snake species. It also harbours a number of endangered animals like Fishing cat, Leopard cat, Dolphins and Porpoises.

Bhitarkanika's famous Gahirmatha coast finds a prominent place in the turtle map of the world because of the distinction of having one of world's largest nesting and breeding congregation of Olive Ridley Sea turtles.

Mangrove wetlands including mudflats provide ideal feeding, perching and nesting facilities to a variety of resident and migratory waterfowl.

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BIODIVERSITY VALUE:

The wetland supports one of the largest mangrove ecosystems after Sundarbans, Gujarat and Andhra Pradesh in the Indian mainland.

It has more than 300 numbers of plant species, which include mangroves, mangrove associates and non mangroves. The floral diversity of Bhitarkanika wetland is known to be largest in India and second largest after Papua New Guinea in the world. Considering the genetic diversity of the wetland and its importance, the mangrove steering committee of Govt. of India have established its National Mangrove Genetic Resource Conservation Centre in one of the islands of this wetland i.e. Kalibhanjadia island.

Biodiversity richness:

The area supports rich biodiversity including mangroves and mangrove associates (71 species), largest population of estuarine crocodiles (1358 as per 2004 census), the rare white crocodile (Sankhua), largest Indian lizards (water monitor), poisonous and non-poisonous snakes like king cobra and python, varieties of resident and migratory birds (217 species) and number of mammalian species (spotted deer, sambar, wild boar, fishing cat, jungle cat, otter etc.) In comparison to the national status, the composition of vertebrate fauna / species of Bhitarkanika project area represents 8% mammals, 17.70% birds, 9.40% reptiles and 2.5 % amphibians. The Gahirmatha sea beach, bordering the sanctuary attracts hundreds and thousands of Olive ridley sea turtles for mass nesting / egg laying (World's largest rookery) during the winter months (January to April).

Endemism and Biological Uniqueness:

Endemism in Bhitarkanika is not fully explored. Yet, it is expected to be there particularly in sectors like mangrove flora and benthic fauna, soil fauna, aquatic flora and fauna. Among the three species of Sundari trees (Heritiera sp.) available, Heritiera kanikensis or Kanika Sundari is endemic to Bhitarkanika.

Bhitarkanika is endowed with a very complex and dynamic ecosystem and is highly fragile in nature. The ecosystem is complex in a sense that all the sub ecosystem namely fresh water, marine and terrestrial are intricately mixed with each other. The essential factor for maintenance of such ecosystem is regular influx of fresh water from adjoining land and tidal inflow from the sea. Any change in the regime of either factor is likely to effect a corresponding change in the mangrove ecosystem.

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Depending upon the degree of inundation, the species composition, richness and diversity varies. Since the area contains older formations and newly accreting landmass, several horizontal zonation of plant communities are met with. The horizontal and vertical zonation of plant communities influenced by influx of fresh water degree of inundation, seasonal rainfall and salinity gradients greatly influence the status of wildlife, their number and distribution

ECOSYSTEM VALUES AND ECOSYSTEM FUNCTIONS:

Mangrove wetland encompasses a host of ecosystems namely; estuarine / brackish water ecosystem, riverine ecosystem, forest ecosystem, etc. Each such ecosystem supports food chains within it to maintain the balance of nature.

Mangroves have been considered as “land builders”. It is believed that the roots of mangroves secrete a substance, which modifies the coarse particles into fine ones and help in soil formation. The tangles of stilt roots also help in sedimentation of particulate matter. Network of mangrove roots provide firm anchorage to the banks of tidal rivers, creeks and also the coast line. It effectively arrests river bank and coastal erosion and ultimately helps in controlling flood damages. It also exercises a moderating influence on the cyclonic wind and storm surges. In the past, serve cyclones and tidal surges of the coastal Kendrapara district; particularly the Rajnagar area, is known to have been effectively controlled due to the presence of thick mangrove vegetation in the zone of Bhitarkanika and the adjoining Mahanadi deltaic area.

Ecosystem Functions:

Mangrove areas support a range of interconnected food webs, which directly sustain the fisheries. Algae and detritus sustain shrimps and prawns, which provide a food source for species such as Bhekti (Lates sp.) Cat fishes etc. Fish and prawns spend most of their adult life at sea and return to the mangrove areas and vice versa to spawn. Some of the commercially important fishes are Ilisha, (Hilisa illisha), Khainga (Mullet sp.), Bhekti (Lates calcarifer), Kantia (Mustus gulia), Kokill (Anchovella sp.) etc. Prawns such as Penaeus indicus, tiger prawn (Penaeus monodon), Metapenaeus affinis and crabs, mainly the mud crabs (Scylla serrata) are exploited in large numbers by the fishermen both in the breeding and non-breeding seasons. Mud skippers, a typical fish reside around and in mangroves. These fishes are able to survive short periods of aerial exposure, skip around on the water and mud and build chimney like burrows.

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Ecological Vulnerability:

Ecological Vulnerability is due to large scale encroachments, current living styles and dependence of people on Bhitarkanika. Although there are known pollution causing Industries like Oswal and PPL, etc. around Bhitarkanika which could affect the ecological soundness, use of chemicals and pesticides in agricultural fields and effluents coming from large number of prawn gherries has some impact on the wildlife depending on the aquatic habitat.

SOCIO-ECONOMIC VALUE

Economic value:

Bhitarkanika mangrove wetland is one of the most productive ecosystems. It adds to the coastal fishery production. The rivers and creeks in the wetland are a major source of variety of indigenous fish. The sheltered waters of mangroves provide nursery ground for commercially harvested prawns and shrimps. Several fish species come to the estuary for breeding. Fishing is the mainstay of the villagers those who do not have any landed property. In addition, the local people depend on the mangrove vegetation for collection of honey, wax and medicinal plants. Around 50 quintal of honey is available per year in Bhitarkanika forests.

Socio-cultural Value:

The wetland has a good number of ancient monuments like palace of ex-zamindar, Shiva temple inside Bhitarkanika forest block, Jagannath temple at Righagarh and Keradagarh, Panchubarahi goddess temple at Satabhaya and others such small temples which are culturally significant to the inhabitants.

Scientific Value:

The Saltwater crocodile “rear and rehabilitation” operation is a success story in Bhitarkanika and the crocodile population in the Bhitarkanika river system has been gradually built up. The captive reared young crocodiles have been released in the creeks and estuaries and above 2200 crocodiles have been released in phases since 1977. Some of the released crocodiles have bred successfully in the wild and above 45 clutches of eggs have been located, which is 6.5% more in comparison to 1975-76.

Bhitarkanika is a living laboratory for Scientists / Biologists perusing studies on Biodiversity and human values. Scientific research on the endangered saltwater crocodiles and Olive Ridley Sea turtles over two decades and half in Bhitarkanika have yielded much scientific data / information on the species and its habitat. Much study need to be done on the flora and fauna which are still remained unexplored.

Ecotourism Potentiality:

Bhitarkanika has become an identified tourist destination in Odisha and is a paradise for nature lovers, conservationists, and biologists. However, the Ecotourism potentiality is yet to be fully explored. Some infrastructures are presently available in places like Chandbali, Dangmal, Dhamara, Habalikhati, Gupti and Ekakula for catering the need of tourists which are being developed and upgraded.

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Aquaculture:

In and around the site, a large chunk of the agriculture land adjacent to rivers and creeks have been converted to prawn farms. Even number of people from outside the area have purchased private land along the coast as well as along the creeks and converted the same to aquaculture farms. They are discharging the untreated effluents from the farm to nearby rivers and creeks and thereby affecting the aquatic fauna and the mangroves.

Fishing:

Fishing in the rivers and creeks by the surrounding local people is posing several adverse factors, the major being obstruction of migratory routes of fishes and blocking of free movement of crocodiles. Sometime, fishing by the local people leads to virtual closure of creeks, thereby the tidal inundation is hampered to a considerable extent. Fishing in the near shore and off shore coastal waters resulting in mortality of endangered Sea turtles, Dolphins, etc. Movement of fishing vessels in the congregated breeding ground of Sea turtles is affecting the social facilitation in Ridleys and disturbing the mating pairs.

DEMOGRAPHY AND PEOPLE'S LIVELIHOOD:

Above 9 lakh people in about 900 revenue villages and hamlets live in and around proposed Bhitarkanika Biosphere Reserve (410 villages in the sanctuary area). The people who live in the villages adjoining mangrove forest blocks earn a part of their livelihood from the mangrove ecosystem, which constitutes about 100 villages.

The livelihood patterns of rest of the villages directly or indirectly influence the very existence and survival of the flora and fauna of the mangrove ecosystem. It is, therefore, essential to provide alternative means of livelihood for the people living in about 100 villages to reduce their dependency on this eco-fragile ecosystem and to take measures so that the land use pattern and also livelihood issues of the rest of the villages shall not exert any negative influence on the existence and survival of this coastal mangrove ecosystem.

THREATS:

Encroachment of forestland by the migratory people and conversion of the same into common homestead and agriculture land are the main problem in this locality. This has put tremendous biotic pressure on the potential mangrove forests. In the encroached land, the tidal creeks are being blocked by earthen bunds, which prevents the natural tidal flow and gradually the mangrove vegetation perish from that area.

CONSERVATION MEASURES:

To wean the poachers away from poaching, a massive awareness programme has been undertaken the efforts are supplemented with the establishment of anti-poaching camps at strategic points. To encourage eco-tourism, training camps for eco-guides and boat-man associations are being organized.

Habitat development inside the sanctuary is being done with funds received from MoEF of Govt. of India. These measures include rising up of plantations, digging and renovation of creeks and digging of ponds.

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The State Forest and Environment Department have taken several measures for conservation and management of this unique wetland and its rich biodiversity, with the support of the Ministry of E &F, Govt. of India. These measures include:

- Building of Data base
- Protection of salt water crocodiles and sea turtles
- Protection of migratory waterfowl and other species prone to poaching for meat
- Weed control
- Restoration of the feeding and roosting habitat of water fowls
- Pollution control
- Creation of awareness about the values and functions of mangroves and wetland
- Research and development activities
- Community participation
- Capacity building
- Institutional strengthening
- Promotion of eco-tourism

MANGROVES OF ODISHA:

SIGNIFICANCE OF MANGROVE ECOSYSTEM:

Mangroves are salt tolerant plant species found in the inter-tidal regions along the creeks and estuaries near the coast, on the river mouth. They play a very significant role in protecting the hinterland against (i) cyclones and (ii) the ingress of sea water during tidal surge. Mangroves stabilize coastal land mass against sea erosion. They are repositories of immense biological diversity and are also the nursery and breeding ground of several marine life forms, such as species of prawns, crabs, fishes and mollusks. Mangroves sustain the ecological security of the coastal areas as well as livelihood security of the thousand of fisherman and other who leave in these areas.

STATUS OF MANGROVES IN ODISHA:

The mangroves all along the Odisha coast are threatened due to high density of population in these areas and competing demand for land for agriculture and prawn farming. The mangrove belt in Kendrapada district called the Bhitarkanika mangrove forests, comprising areas between in

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the Dhamara mouth to Barunei on the coast, has been notified as Bhitarkanika Sanctuary (672 Sq.km.).

Part of this area (145 Sq.km) is notified as National Park. This stretch of mangrove is the only area, which is relatively well preserved. Mangrove vegetation in Mahanadi delta region between Barunei mouths to Mahanadi mouth (Paradip) is fragmented and degraded due to large-scale encroachment of these areas. Further south, sparse mangrove vegetation occurs along the coast from Mahanadi mouth to Devi mouth. Degraded mangroves also occur to the north of Dhamara mouth up to Chudamani in Bhadrakh District coast, and also on Subarnarekha mouth in Balasore District.

CONSERVATION HIGHLIGHTS:

- A state level Steering Committee under the chairmanship of Chief Secretary for Conservation and Management of Mangroves and Coral reefs in Odisha has been constituted for this purpose.
- Mangroves of Bramhani -Baitarani delta in Kendrapada district have been declared as Bhitarkanika Wildlife Sanctuary in April 1975 covering an area of 672 Sq.km and the core area of the sanctuary has been declared as Bhitarkanika National Park in September, 1998 covering an area of 145 Sq.km.
- Bordering the Bhitarkanika sanctuary/National Park, an area of 1435 Sq. km. (out of which 1408 Sq.km. is sea to a width of 20kms. form the coast) has been declared as Gahirmatha Marine Wildlife sanctuary in September, 1997. It covers two Reserve Forest Blocks of Mahanadi delta mangroves comprising 27 Sq.km.
- Creation of a Wildlife Division at Chandbali in 1980 which was later renamed as Mangrove Forest Division (Wildlife), Rajnagar, with jurisdiction over the entire coastal mangrove forests of Bhadrakh, Kendrapada, and Jagatsinghpur district. With affect from 1.10.2003, the mangrove forest of Kendrapada and Jagatsinghpur Districts have been constituted into Rajnagar Wildlife Division, while the mangrove areas of Bhadrakh and Puri Districts are now part of Bhadrakh and Puri Wildlife Divisions.
- Bhitarkanika Sanctuary area has been designated as a 'RAMSAR SITE' (i.e., Wetland of International importance) during the 8th meeting of the contracting parties held at Valencia from 18-26th November 2002. In Odisha this is the 2nd wetland of International importance under Ramsar Convention and is one of the 19 such sites in the country.

  Mangroves of Bhitarkanika and Mahanadi delta have been considered as a single ecological unit and have been proposed to be designated as a Biosphere Reserve.
- Implementation of Management Action Plans (MAPs) since 2000-01 for conservation and management of mangroves at six identified locations, namely Bhitarkanika, Mahanadi delta, Dhamara, Devi-Kadua, Subarnarekha and Chilika under the central plan scheme of Government of India.

CONSERVATION MEASURES ON THE ENVIL:

- Completion of Reservation proceedings of all mangrove forest blocks, UN-surveyed areas, newly emerged islands/ mudflats, etc. in all deltaic regions and declaration of these areas as Reserve Forests within a specified time frame so as to provide proper legal cover against

encroachment and unsustainable use of these forest/ Sanctuary lands. Disposal of all title suits and misc. court cases within a specified time frame.

- Final notification of Bhitarkanika Wildlife Sanctuary under section 26(A) of the Wildlife (Protection) Act, 1972.
- Demolition of all un-authorized prawn gherries in mangrove areas/ CRZ areas.
- Massive afforestation of degraded mangrove areas, banks of tidal rivers.
- Provision of adequate staff, transport and communication facilities.
- Preparation of mangrove atlas based on digitized GIS maps of all mangrove areas, showing their actual land use pattern.
- Removal and prevention of encroachment of mangrove wetlands.
- Prevention of re-encroachment of the mangrove areas retrieved after eviction of encroachers.
- Steps for identification, quantification and reduction of dependencies on mangrove forests.
- Providing alternate sources of livelihood and employment generation through Eco-development programmes.

ECOLOGY RELATED LEGISLATIONS IN INDIA:

Considering the complexity in terms of conservation of biodiversity, sustainability of the natural ecosystems and the livelihood dependence of the local communities, the government needs to address national and global issues related to carbon accumulation, biodiversity conservation, and continued flow of ecosystem services. These measures provide opportunities for strengthening documentation and data collection; empowering local communities by recognizing responsibilities, ownerships, rights, and concessions; and creating suitable institutions. The legislative provisions developed as a follow-up to such national policies are listed below:

INDIAN FOREST ACT, 1927:

This Act recognizes forest dwellers' rights and makes conservation more accountable. The Act basically does two things: (i) Grants legal recognition to the rights of traditional forest dwelling communities, partially correcting the injustice caused by the forest laws, and (ii) Makes a beginning towards giving communities and the public a voice in forest and wildlife conservation.

The law recognizes three types of rights:

Land Rights- Land rights are given to people, who have been cultivating land prior to December, 13, 2005.

Use Rights- The law provides for rights to use and/or collect the minor forest produce things like tendupatta, herbs, medicinal plants etc "that has been traditionally collected, use of grazing grounds and water bodies and use of traditional areas by nomadic or pastoralist communities i.e. communities that move with their herds, as opposed to practicing settled agriculture.

Right to Protect and Conserve- Besides, the law also gives rights to protect and manage the forests to people of village communities.

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The Act also categorizes forests into three categories:

Reserve forest- These forests are the most restricted forests and may be constituted by the State Government on any forest land or waste land which is the property of the Government or on which the Government has proprietary rights. In reserved forests, most uses by local people are prohibited, unless specifically allowed by a Forest Officer in the course of settlement.

Protected forest- The State Government is empowered to constitute any land other than reserved forests as protected forests over which the Government has proprietary rights. Under 'Protected Forests', the Government retains the power to issue rules regarding the use of such forests and retains the power to reserve the specific tree species in the protected forests. This power has been used to establish State control over trees, whose timber, fruit or other non-wood products have revenue-raising potential.

Village forest- 'Village forests' are the one in which the State Government may assign to 'any village community the rights of Government to or over any land which has been constituted a reserved forest'.

WILDLIFE PROTECTION ACT, 1972 (WITH AMENDMENT ACTS OF 2003 AND 2006):

The act provides for the protection of wild animals, birds and plants and matters connected with them, with a view to ensure the ecological and environmental security of India. The act constitutes a National Board for Wildlife that provides guidelines for framing policies and advising Central and State Government on promotion of wildlife conservation and controlling poaching and illegal trade of wildlife and its products; Making recommendations for setting up and managing national parks, sanctuaries and other protected areas; and suggesting measures for improvement of wildlife conservation. It also sets up National Tiger Conservation Authority. The acts sets up various provisions related to trade and penalties for hunting the animals in wild. Five kinds of protected areas can be notified in the Act. These are:

Sanctuaries- The State or Central Government may by notification declare its intention to constitute any area as a sanctuary for protecting wildlife and the environment. The government determines the nature and extent of rights of persons in or over the land within the sanctuary. National Parks: The State or Central Government may declare an area, whether inside a sanctuary or not, as a national park for the purpose of protecting and developing wildlife and its environment. The State Government cannot alter the boundaries of a national park except on the recommendation of the National Board for Wildlife. No grazing is allowed inside a national park. All provisions applicable to a sanctuary are also applicable to a national park. Conservation Reserves- The State Government after consultations with local communities can declare any area owned by the Government, particularly areas adjacent to national parks or sanctuaries, as conservation reserves. The government constitutes a Conservation Reserve Management Committee to manage and conserve the conservation reserve.

Community Reserves- The State Government can, in consultation with the community or an individual who have volunteered to conserve wildlife, declare any private or community land as community reserve. A Community Reserve Management Committee shall be constituted by State Government for conserving and managing the reserve.

Tiger Reserve- These areas were reserved for protection tiger in the country. The State Government on the recommendation of the Tiger Conservation Authority may notify an area as a tiger reserve, for which it has to prepare a Tiger Conservation Plan.

THE ENVIRONMENT (PROTECTION) ACT 1986:

The Environment Protection Act, 1986 was constituted on 19 Nov, 1986, to provide for the protection and improvement of environment and for matters connected with environment that lays down the standards, policies and act of environmental degradations and policies for improvement of environment and prevention of human beings from environmental hazards. It describes rules to regulate environmental pollution, laying down procedures and standards for industrial waste, emissions, hazardous waste etc. Besides, it deals with the prevention, control and abatement of environmental pollution.

BIOLOGICAL DIVERSITY ACT, 2002:

The government passed the biodiversity act to conserve and promote sustainable use of biological diversity and to regulate the access to biological resources of the country with equitable share in benefits. It sets up National Biodiversity Authority (NBA), State Biodiversity Board (SBB) and Biodiversity Management Committees. Besides, it aims to respect and protect knowledge of local communities traditional knowledge related to biodiversity and secure sharing of benefits with local people as conservers of biological resources and holders of knowledge and information relating to the use of biological resources. Besides, it also has provisions for notifying heritage sites by State Government in consultation with local body.

NATIONAL GREEN TRIBUNAL ACT, 2010:

The Act enables creation of a special tribunal to handle the expeditious disposal of the cases pertaining to environmental issues. The Tribunal has Original Jurisdiction on matters of “substantial question relating to environment” & “damage to environment due to specific activity.” Tribunal is competent to hear cases for several acts such as Forest (Conservation) Act, Biological Diversity Act, Environment (Protection) Act, Water & Air (Prevention & control of Pollution) Acts etc. and also have appellate jurisdiction related to above acts after establishment of Tribunal within a period of 30 days of award or order received by aggrieved party.

IUCN RED LIST AND ITS UTILITY:

The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List), founded in 1964, is the world’s most comprehensive inventory of the global conservation status of

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biological species. The International Union for Conservation of Nature (IUCN) is the world's main authority on the conservation status of species. A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit.

The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction. According to IUCN (1996), the formally stated goals of the Red List are:

(1) To provide scientifically based information on the status of species and subspecies at a global level,

(2) To draw attention to the magnitude and importance of threatened biodiversity,

(3) To influence national and international policy and decision-making, and

(4) To provide information to guide actions to conserve biological diversity.

Climate Change Action Plan:

Odisha was one of the first states that formulated Climate Change Action Plan, through a comprehensive consultative process way back in 2010. The State Government is implementing Climate Change Action Plan to combat the challenges due to climate change. Forest & Environment Department is the Nodal Department for coordinating the implementation of various activities envisaged under State Climate Change Action Plan. A Climate Change Cell has been constituted for interacting with other departments, stakeholders and external agencies for implementation of the key & prioritized activities and take stock of the progress made in implementation of State Action Plan on Climate Change.

Awards:

The State Government has awarded 238 Prakruti Mitra 2015-16 during the eco model exhibition on World Environment Day 2015, in order to encourage environmental protection, in which 64 eco clubs of the State participated. State Forestry Awards are conferred, on the occasion of "World Forestry Day" every year, for outstanding work in afforestation and plantation activities to Grampanchayats, educational institutes and individual students. Besides, these awards are also given to Forest staff every year for their meritorious work in the field of Forest protection, afforestation, Kendu leaf operation etc. "Biju Pattnaik award for wild life conservation", is being given for outstanding contribution in the field of wildlife conservation.

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Chapter - 17

PREVIOUS YEAR QUESTIONS

17

PREVIOUS YEAR QUESTIONS

OPSC 2016

Write short notes on the following questions. (5 marks each)

1. Drainage systems in Odisha.
2. Coastal Plains in Eastern Odisha.
3. Disaster Management and Planning Perspective in Odisha.
4. Mineral resources of Odisha.
5. Dandakaranya Development Authority.
6. Environmental Significance of Mangrove Forests in Odisha.

OPSC 2015

Write short notes on the following questions. (5 marks each)

1. Physiographic Characteristics of Odisha.
2. Features of Northern Tropical Semi Ever Green Forests of Odisha.
3. Problems encountered by the ecosystem of the Chilika Lake.
4. Major projects constructed across the main river of the largest river basin of Odisha.
5. Gandhamardan Hills.

OPSC 2011

Write short notes on the following questions. (5 marks each)

1. The impact of tropical depressions on the coastal low lands of Odisha.
2. Localization of Aluminium industry in Odisha.
3. The hinterland of Paradip Port
4. Environmental problems of tribal regions of Odisha.
5. Developmental issues of the Highland regions of Odisha.

OPSC 2006

Write short notes on the following questions. (5 marks each)

1. Hirakud Dam -A Multipurpose Project
2. Chilika Lake – A Tourist Resort

3. Chief Iron Ore mining areas
4. Major river systems
5. Physiographic characteristics of coastal plain
6. Puri as a centre of pilgrimage.
7. The chief coal producing areas of odisha.
8. Chilika lake as a tourist resort.
9. Population concentration in capital city of Bhubaneswar.
10. Human induced environmental problems in Odisha.

OPSC MISC

Write short notes on the following questions. (5 marks each)

1. Major deposits of Bauxite found in Odisha.
2. Important Minerals of Odisha. In which districts they are found ?
3. Mahanadi Godavari interlinking.
4. Explain Pani Panchayat introduced in Odisha.
5. Has the power sector reform benefitted Odishan people ?

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